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CHRONIC CYANOSIS, WITH POLYCYTHÆMIA AND ENLARGED SPLEEN: A NEW CLINICAL ENTITY.

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The group of cases here reported, with those collected from the literature, are worthy of careful study, as we have here in all probability "a definite clinical entity and one which is new to medical science," to use the words of Saundby and Russell in describing their case. The condition is characterized by chronic cyanosis, polycythæmia, and moderate enlargement of the spleen. The chief symptoms have been weakness, prostration, constipation, headache, and vertigo. A further analysis will be reserved until after the consideration of the cases:

Case I. *Cyanosis for years, of unknown origin; albuminuria; rapid pulse; polycythæmia; high vascular tension.*—Dr. K., aged forty-four years, consulted me October 28, 1901, complaining of a rapid pulse and diffuse cyanosis. He has been a very healthy man, active and vigorous, of good habits; has had no serious illnesses. He has been uneasy about himself, as he had detected a trace of albumin in the urine. For several years his wife has noticed that he has had a very congested appearance, and the eyes would often be deeply suffused. I have seen him at intervals for the past five years and have known him to be a very blue-faced man. He has been of a constipated habit. His eyes are somewhat prominent, but his wife says this is natural to him. He has constantly a feeling of fulness in the head, sometimes a sensation of vertigo, and for these symptoms he consulted me.

He was a well-built, well-nourished man; the face much suffused; the ears looked a little blue; the conjunctivæ were injected, and the lips distinctly cyanotic. The tongue also looked cyanotic. The general surface of the skin looked suffused and the anæmia left after pressure of the hand on the skin was very marked and very slowly

obliterated. The feet and hands were quite cyanosed. The radials and temporals were moderately sclerotic. Pulse 120, regular. Apex beat in fifth, just inside the nipple line; sounds clear; aortic second a little accentuated. There was no enlargement of the thyroid. No enlargement of the liver; moderate enlargement of the spleen, the edge of which was palpable. The chest was well formed, not barrel-shaped; the cervical muscles not prominent. Expansion of the chest good. No sign of emphysema. Expiration not prolonged. Once or twice he called on cold days to show the extreme cyanosis, and twice he came in with cough, which troubled him chiefly at night.

Several careful analyses of the urine were made by Dr. Futcher. The specific gravity ranged from 1012 to 1017; albumin was constantly present, as a rule only a trace; no sugar. On centrifugalizing there were a few hyaline and finely granular casts.

I was very much puzzled as to the nature of this case, and thought that he had some chronic degeneration of the kidneys, with slight arterio-sclerosis, but I did not think it could be advanced, as there was no marked hypertrophy of the heart, and the aortic second was not specially ringing. I could not account for the cyanosis.

Blood. The examinations were made by Dr. Futcher. Drop from ear almost black in color; flows sluggishly. A striking feature is the slowness with which the drop spreads under the cover. With the usual-sized drop the field is found almost filled with red cells; they look natural. Another striking feature is the relative scarcity of leucocytes. Red blood corpuscles, 9,952,000; leucocytes, 4000; hæmoglobin, 120 per cent. (Fleischl). No measurements of the red cells were made. Several counts were made, as it was thought that there might have been a mistake.

Two observations of the blood pressure, taken on the right arm when he had been in the sitting posture for about ten minutes, gave maximum pressure, 203 mm. Hg.; minimum pressure, 175 mm. Hg. Five minutes later the maximum pressure, 200 mm. Hg.; minimum pressure, 172 mm. Hg.

I saw this patient repeatedly during 1902. There was very little change in the condition. The cyanosis was always marked. He was able to attend to his practice. There was no shortness of breath; the heart's action became slower. I once counted it at 72, but he said that it was often at 120 per minute. The last examination of the urine, November 14th, showed only a trace of albumin and a few hyaline casts. The spleen never became much enlarged, but it was always easily palpable. He went to California and has since been under the observation of Dr. McBride.

Case II. *Recurring attacks of nausea and vomiting; remarkable cyanosis, of some years' duration; pain in side; polycythæmia; albuminuria.*—M. C. (General Hospital Nos. 31202, 34970, 38753, 40820, 42041), aged thirty-five years, a Russian Jew; tailor by occupation; admitted for the first time on July 11, 1900, complaining of constipation.

The family history was unimportant.

Personal History. The patient has always been well. Since coming to this country, six years ago, he has been pressing in a tailor-shop, and has had to work standing. He denies gonorrhœa and syphilis. He uses alcohol moderately. Ever since coming to the United States the patient has been troubled with constipation, the bowels never moving

more frequently than every second day. This is worse in the summer. Three years ago, during the summer, the bowels on one occasion were constipated for fourteen days. There is no pain during these attacks. For a long time he has been dark in color; he does not know for how long, but his friends have noticed it.

The patient's bowels moved eight days before admission after taking licorice powder. He had been constipated for four days previous to that. Seven days ago the patient began to vomit after each meal. He has vomited daily since. Castor oil, Epsom salts, and licorice powder have been ineffectual. There have been no other symptoms save that of drowsiness. The patient has voided very little urine during these eight days.

On examination the patient was a well-nourished man, with marked cyanosis of the face, hands, and mucous membrane; the tongue was heavily coated.

The physical examination proved entirely negative, except for the cyanosis already noted. The temperature reached 102° shortly after admission, and fell to normal by midnight and remained so. On this day the blood count was: red blood corpuscles, 7,172,000; leucocytes, 21,800; hæmoglobin, 120 per cent.; no malarial parasites found; Widal reaction negative.

On July 16th the blood count was: red blood corpuscles, 6,520,000; leucocytes, 14,400; hæmoglobin, 102 per cent. The patient is feeling very much better and the bowels are moving regularly.

The patient was admitted for the second time on May 27, 1901, complaining of vomiting, which came on five days before admission. The patient admitted excessive indulgence in soda-water on the day of the illness. He states that he has vomited "every moment" since the onset, and that there has been some blood in the vomitus, which is very foul-smelling. The bowels have been constipated since the onset. He has eaten nothing for several days. There is no abdominal pain.

May 29th. Dr. Futcher noted that the cyanosis was still very marked, especially in the buccal mucosa, and that there was a marked pyorrhœa alveolaris. Slight tenderness in the right iliac fossa. The spleen and liver were not enlarged.

27th. The blood count gave red blood corpuscles, 8,900,000; leucocytes, 23,000; hæmoglobin, 125 per cent.

28th. Vomiting continues unabated. Calomel, cerium oxalate, and lavage have been ineffectual in stopping it. Analysis of the vomitus: total acidity, 85; free HCl, 37; no lactic acid.

29th. Red blood corpuscles, 10,200,000; hæmoglobin, 112 per cent.

30th. Lips very livid; the general surface of the skin, including face, trunk, and extremities suffused. The imprint of the hand disappears very slowly, and the nails are a little cyanosed.

June 1st. Patient's bowels were finally moved by a high enema. The blood count was as follows: Red blood corpuscles, 7,576,000; leucocytes, 30,000; hæmoglobin, 115 per cent.; specific gravity (chloroform and benzol method), 1068.

4th. The patient was discharged feeling greatly improved, the bowels having commenced to move somewhat more freely.

The patient was admitted for the third time on April 29, 1902, complaining of an attack of vomiting, hiccoughing, and constipation, which began seven weeks previously. He had vomited bile several times.

The attacks of vomiting have lasted for ten or twelve days at a time and recurred repeatedly. The blood count on admission was as follows: Red blood corpuscles, 7,144,000; leucocytes, 8,600; hæmoglobin, 110 per cent.

On April 30th Dr. McCrea noted that the area of stomach tympany was slightly increased; cyanosis still present; considerable pigmentation of the skin. Differential count of the leucocytes: Polymorphonuclear, 79.4 per cent.; small mononuclear, 14 per cent.; large mononuclear, 2.4 per cent.; eosinophiles, 1.8 per cent.; transitionals, 2 per cent. A test-meal showed free HCl present; no lactic acid. On two successive days after a long fast the stomach-contents were removed and revealed a fair amount of free HCl. The blood count on May 12th was little changed.

On May 22d the patient was discharged improved, the bowels moving regularly.

The urine had a specific gravity of 1010 to 1020, with a trace of albumin and a few casts, usually hyaline, but on one admission granular.

The fourth admission was on November 7, 1902, the patient stating that he was awakened at 4 A.M., three days before admission, with a pain in the left side, followed by vomiting, which has been continuous since. No blood in the vomitus. Constipation for five days. The patient has not eaten anything since the onset and has taken very little water. There has been some hiccoughing. Blood count: Red blood corpuscles, 7,316,000; leucocytes, 12,300; hæmoglobin, 112 per cent. The cyanosis is still very marked. There is some dyspnœa, vomiting, and hiccoughing. A differential count of the leucocytes shows a slight increase in the polymorphonuclears and a diminution in the small mononuclears since the previous record. The specific gravity of the blood is 1083.

November 12th. Red blood corpuscles, 8,300,000.

15th. Red blood corpuscles, 6,700.000. Coagulation time, one and a half minutes. Specific gravity, 1072.

19th. The vomiting persisted until two days ago and the vomitus showed at all times free HCl; no lactic acid; slight starch digestion. The constipation was also very obstinate until yesterday. Discharged improved.

Patient admitted for the fifth time on January 28, 1903, and for the sixth time March 11th. On both of these occasions the chief symptoms were pain in the left side and the obstinate constipation. He says that the pain brings on the vomiting. The vomitus is at first frothy and white, later greenish in color. The pain is deep below the tenth and eleventh ribs on the left side, and extends toward the posterior axillary fold. On his last admission the cyanosis was extreme, the face was almost black, and the expression very anxious. There was no albumin in the urine, but on March 30th there were a few granular casts. The blood pressure was 125; the specific gravity of the blood 1081. The bowels were freely moved, and this always gives him relief. On the last admission there was very little vomiting, yet the cyanosis was never more marked.

May 25th. Patient has been keeping very well and is at work. He complains of pain in the left side, under the ribs, and says that as he walks he keeps his hand over the sore spot. The cyanosis is marked,

quite as much as at any time in the hospital. The impression of the hand on the skin of the trunk remains a long time. The spleen is not palpable; the vertical flatness is about four inches in extent. He thinks that the skin has become darker.

CASE III. (Dr. Lowman.) *Chronic cyanosis; enlarged spleen; polycythæmia; headache; increased tension; albuminuria.*—While making a visit at the Lakeside Hospital, Cleveland, with Dr. Lowman, my attention was directed to a patient who was unusually cyanosed and who had an enlarged spleen. On further examination the case was found to belong to the group under consideration. I am indebted to Dr. Darby, Dr. Lowman's first assistant, for the notes of the case.

Female, aged forty-four years, married, of English descent, admitted to the ophthalmological division of the hospital for double pterygium, failing vision, and headache; for the latter she was transferred to the medical service. The condition of the fundi was negative, with the exception of tortuosity of the vessels.

The family history was negative.

She had had the usual infectious diseases. She had been a very healthy woman of good habits. There was no history of syphilis. She had not had winter cough or attacks of asthma. She has two children living and well. For many years, she does not know how long, she has been blue. She has had no cough, no special shortness of breath on exertion. For four years she has had headaches, which have become more intense during the past four months. They begin over the left eye and extend backward and down the neck.

On examination the patient is well nourished; the skin is dark in color, and there is a general cyanosis, particularly marked on the face, arms, and upper part of the trunk; the feet and toes are blue. Everywhere the impression made with the finger disappears slowly. The conjunctivæ are suffused. The eyes are not specially prominent. There is well-marked pterygium. Looking more closely at the face there are some distended venules about the nose and cheeks. The lips are quite cyanosed, and the tongue and buccal mucous membranes have a dusky blue color. The radials are moderately sclerotic; the vessels seem full and the tension high. The apex beat of the heart cannot be felt; there is no visible shock; no enlargement upward or to the right. The sounds are clear; the second pulmonic is accentuated. The chest is not barrel-shaped. Percussion note is clear everywhere, and there are no bronchitic râles; no prolongation of expiration.

The abdomen looks normal. On palpation the spleen is enlarged, extending 7.5 cm. below the costal margin; the anterior margin and the notch are easily felt. The upper limit of flatness is on the eighth rib. The liver is not enlarged.

Blood. April 13, 1903, red blood corpuscles, 11,616,000; leucocytes, 5100. Differential count: Polynuclears, 59 per cent.; lymphocytes, 32 per cent.; large mononuclears, 8 per cent.; eosinophiles, 0.5 per cent. Hæmoglobin, 120 per cent. Specific gravity, 1067. A subsequent examination made on May 8th gave the red blood corpuscles 10,692,000.

Urine. No excess of the daily amount; clear in color; specific gravity ranged from 1010 to 1016; reaction acid; a trace of albumin and a moderate number of hyaline and granular casts.

At my suggestion the patient was put upon sodium nitrite, and Dr.

Darby writes, under date of May 8th, that the headaches have entirely disappeared.

CASE IV. (Dr. Stockton.) *Chronic cyanosis; general weakness; headache, and general pains, with attacks of weakness and shortness of breath; pigmentation of skin; death; autopsy.*—When speaking of the condition with Dr. Lyon, of Buffalo, he mentioned a remarkable case of chronic cyanosis in the Buffalo Hospital under the care of Dr. Stockton, and on his return he found that there was polycythæmia. To the former I am indebted for the following notes, and to the latter for permission to use them:

J. T., a Turkish Jew, aged forty-six years, married, a shoemaker, had been admitted to various Buffalo hospitals (General, Erie County, German, etc.) for several years on different occasions, and died in the German Hospital, Friday, May 1, 1903.

His chief complaint was general weakness, chronic headache; pain in the feet and legs, made worse by walking; general diffuse pains in the abdomen, pains also over the region of the heart, moderate chronic constipation, a slight cough, and occasional attacks of shortness of breath.

For about twenty years he has had a slight cough, off and on, worse in the winter and at night. Headache has troubled him for the same period (twenty years), and indefinite pain in the chest has been felt more or less during the past twenty years. His general strength had been of exceptional vigor until about six years ago, when it began to fail. About four years ago he began to grow much darker and bluer in his skin—cyanosed. Then he began also to have pains in different parts of his body, pain and a prickling sensation in the legs and feet, pain in the right chest and right shoulder; pain in the abdomen, not localized, but diffuse and general; headache continuing. The pain in different parts of the body was not constant, but shifted from time to time. However, the headache and the pain in the legs and abdomen were present with tolerable constancy and have continued so up to his death. The pain was described as dull and aching. In addition to the pains, he had marked weakness during the last six years of life.

Constipation was never a marked feature of the case, though the bowels were generally sluggish. The appetite was poor and capricious. He had nausea occasionally, but never vomited.

During the past four years he had been going from hospital to hospital, spending a few months at a time in each, until he felt better, then returning to his home and trying to work, but soon being required to return to a hospital because of his weakness, headache, body pains, and sometimes shortness of breath. In the hospital he would remain in bed most of the time, or sit quietly in a chair, occasionally walking slowly around the ward or going to the dining-room for his meals.

Cyanosis. The most striking feature of the case during the past four years has been a high-grade, extreme, general cyanosis, making the patient an object of general interest and curiosity in the various hospitals where he sojourned. His entire skin was dusky and bluish and his mucous membranes livid, resembling the appearance of a "blue baby" with congenital heart disease; in fact, he was jocularly called the "blue baby." This cyanosis was constant, though at times after rest in bed it improved somewhat, and again at other times was much intensified.

Pigmentation. The skin was generally dark and showed fine punctiform mottling or pigmentation, suggesting capillary extravasation as a cause, though no definite history of subcutaneous hemorrhages could be obtained. The naturally pigmented parts of the body were much more deeply pigmented than normal. The mucous membranes showed no appreciable areas of pigmentation.

Dyspnœa. During the last three years of life he had occasional attacks of increased weakness, cyanosis, and dyspnœa, his body becoming cold, so that his wife had often thought him dying. In the hospital, however, dyspnœa was seldom marked, though the respirations were generally moderately increased.

Physical Examination. A short, stocky, well-built, and well-muscled man. Cyanosis as already noted. Pigmentation as already noted.

Heart. The heart sounds were always clear and without murmur at any time, but were generally rather weak, except the second pulmonic sound, which was somewhat accentuated. The heart's area by deep percussion was slightly enlarged to the left and right. In the sixth interspace, about one and a half inches to the left of the nipple line, could be seen an area of pulsation, the chest wall dimpling inward with each systole—*i. e.*, systolic retraction. This sign required a careful inspection to be seen.

Vessels. The arteries were soft and compressible. The veins were everywhere full and visible. There was slight throbbing of the vessels of the neck, above the clavicles, thought to be arterial.

Thorax. The lungs were everywhere hyperresonant on percussion, and the area of resonance extended downward at the bases behind somewhat, and in front on the right side the area of liver dulness did not begin until the seventh space was reached in the parasternal line. The area of resonance above the clavicles was not appreciably increased. On auscultation the breath sounds were soft and expiration was not prolonged. Occasional wheezes and sibilant râles could be heard over both lungs on different occasions during the last few months of life. (Dr. Thayer, who saw this case with Dr. Lyon, tells me that the state of the chest did not suggest to him emphysema.)

Liver. Flatness began in seventh space in parasternal line and extended vertically downward to about two inches below costal margin, where the edge could be felt.

Spleen. Never palpable, and its area on percussion was less than normal (perhaps explained by the emphysema of the lungs).

Abdomen normal.

Glands normal.

Legs. Occasionally very trifling œdema was observed over the ankles, more distinct on the left side. No œdema elsewhere was ever observed.

Eye Examination, February, 1903. Both disks hyperæmic. Retina surrounding disks thickened. Vessels, particularly veins, engorged and tortuous.

Urine. An occasional trace of albumin; otherwise negative.

X-ray Examination of Thorax. Nothing abnormal except slightly enlarged heart.

Blood. The blood from the ear or finger-tip was on many occasions during the last few months of life examined and found extremely dark in color, and so thick that it would adhere to one side of thin filter

paper without penetrating it. The depth of color and darkness of the blood was far beyond the range of estimation for hæmoglobin by the color scales of the various hæmoglobinometers. The red corpuscles were never counted until the day of death, when they were counted at 8,250,000. Differential leucocyte count normal. Leucocytes were generally about 8300, never showing a hyperleucocytosis.

Pulse. The pulse was generally about normal, occasionally after exertion rising temporarily as high as 120 to the minute.

Temperature always normal.

Respirations. The general respiratory rate was from 22 to 25 per minute, once reaching 50 after severe exertion, with symptoms of collapse. On the afternoon of death the respirations were 38 per minute.

Death occurred on May 1, 1903, at 7 P.M., at the German Hospital in Buffalo, after three days' residence in the hospital. The patient died, without any special symptoms or discoverable complications, in collapse and after a few hours of drowsiness deepening into semiconsciousness.

The full report of the autopsy is not yet available, but Dr. Lyon writes that the heart was about normal; the lungs showed moderate emphysema, with cyanosis and œdema; the spleen was moderately enlarged. Nothing definite was found to account for the condition.

Cases from the Literature.

CASE V. (Vaquez, *Bulletin Médical*, Paris, 1892, vi., 849.)—Male, aged forty years. For ten years extremities cyanosed; veins distended. Then palpitations, dyspepsia, bronchial catarrh. Three years ago vertigo (Ménière type); buzzing and whistling in ears; staggering and eddying of objects; vomiting; no unconsciousness. Gums swollen, bleeding on irritation.

On examination, chronic cyanosis; no œdema. Heart: No definite auscultatory phenomenon. Blood: Red blood corpuscles, 8,900,000; leucocytes, normal.

Second admission: Paroxysmal vertigo. Attack of pain in lumbar region, ended by discharge of red blood corpuscles in urine, lasting four to six days. Liver enlarged, 20 cm. in right mammary line. Spleen 24 cm. in extent. Urine, three litres daily; same amount of fluid as ingested. Blood: Finger, 8,450,000; elbow, 8,200,000, once 9,130,000; specific gravity, 1080; hæmoglobin, 165 per cent.; hyperalkalinity of blood.

Pathology. Probable hyperactivity of hæmatopoietic organs, for of two cases of congenital cyanosis, one, with red blood corpuscles, 7,000,000, had a large spleen; the other, with 4,500,000, had no palpable spleen.

CASE VI. (Cabot, *Boston Medical and Surgical Journal*, December 7, 1899.)—Female, aged forty-six years, widow, masseuse. Six years before admission she had sudden loss of consciousness, with settling of blood on one side of face and thick speech, which lasted several days. Four years later, after a period of hard work, she began to have periods of collapse, mental and muscular; face became purple, eyes injected; she was once thought to be drunk; vasomotor phenomena often present. Sciatica two weeks before admission; ecchymoses on thigh.

On examination, cyanosis of the face and tongue. Heart: No murmurs. Urine: Trace of albumin; a few hyaline casts. Blood: Red blood corpuscles, 10,460,000; leucocytes, 20,000; hæmoglobin, 150 per cent. Heart apparently normal; pulse 90. No note on the spleen.

Course. Rested well in summer, but still cyanotic. Thyroid treatment had no effect. Later on, after tooth extraction, bleeding lasted half a day; made her better. Soon afterward she had attacks in which her legs began to move spontaneously, the feet moving around each other. A second attack on the train in two weeks. Soon weakness of left arm and leg, headache, vomiting. She died comatose.

Autopsy. Hemorrhage, middle meningeal; passive congestion of all the viscera.

CASE VII. (Cabot, *Boston Medical and Surgical Journal*, March 15, 1900.)—Female, aged forty-nine years, spinster. Complaint, vertigo, weakness, bad taste, constipation. Blue line noted. Given potassium iodide and cascara.

One year later, trace of albumin and hyaline casts in the urine. Lead detected in the blood. Blood: Hæmoglobin, 120 per cent.

Father died of "consumption of blood."

Otitis media at eighteen years; several attacks of rheumatism. Menopause at forty-six years. Since then vertigo, palpitation, and headache; dizzy most of time. No tinnitus or nausea or eye symptoms. Cyanosis of lips for six months. Constipation. Four months ago three teeth drawn; then stomatitis set in. Itching at night. Polyuria.

On examination, cyanosis of face and mouth, hands and feet. Heart: Slight systolic murmur at pulmonary area. Spleen enlarged up and down. Hæmoglobin, 120 per cent. In one week vertigo and cyanosis diminished. Hæmoglobin, however, remained at 120 per cent. Four years later, red blood corpuscles, 12,000,000; spongy, bleeding gums; vertigo and staggering; skin bronzed. Lost twenty pounds in six years. Spleen a hand's breadth below ribs. Red blood corpuscles, 9,252,000; leucocytes, 10,600; hæmoglobin, 110 per cent. After venesection, red blood corpuscles, 10,032,000; normoblasts, 5. Later spleen reached to navel; red blood corpuscles, 11,352,000. Examination of gastric contents: No free HCl.

CASE VIII. (McKeen, *Boston Medical and Surgical Journal*, 1901, cxliv., 610.)—Male, aged fifty-three years, German, packer in iron foundry.

Family history unimportant.

Personal History. Dyspnœa twenty years ago, eight days; recurred at intervals of six months to two years. Alcohol, beer, and whiskey used moderately.

Present Illness. One and a half years ago cyanosis of face and hands following an attack of dyspnœa. The cyanosis has persisted since, with exacerbations. Works right along; exertion causes no dyspnœa or cyanosis. Every second or third day blurring of vision, sweating, vertigo, staggering; no headache or tinnitus. When blue the hands are cold and numb. For two years frequent attacks of diarrhœa, sometimes with prolapsus recti.

On examination, no dyspnœa; respirations 18 to the minute. Cyanosis of face, hands, and feet. Fingers clubbed. Erythema on

shoulders and chest. Eyes congested. Tongue cyanotic. Gums swollen and bleeding. Many of the teeth loose. Arteries slightly thick. Heart, no murmurs. Lungs hyperresonant. Spleen one inch below rib, descending to two and a half inches on deep inspiration. X-ray showed emphysema. Urine: A trace of albumin, granular casts, red blood corpuscles, and leucocytes. Blood: Red blood corpuscles, 9,380,000 to 9,840,000; leucocytes, 9000; hæmoglobin, 120 per cent.

Case IX. (Saundby and Russell, *Lancet*, 1902, i., 515.)—Male, aged forty-three years, an electroplater. First visit on April 13, 1891, complaining of pains in body, especially abdomen; headache for three or four months. Spleen enlarged. Urine: Specific gravity, 1010; a trace of albumin; no casts.

Second visit on January 29, 1898, complaining of cyanosis.

Family History. Mother died of phthisis.

Personal History. Syphilis at nineteen years, gastric fever at twenty-four years, later jaundice.

Present Illness. Eight months ago pains, gnawing, in abdomen, worse in morning; no vomiting; constipation. For six weeks loss of flesh and weakness.

On examination, dull, speech thick, memory and attention poor. Cyanosis of face. Fingers clubbed. Teeth bad. Bronzing of legs. Spleen extends to middle line and navel; hard, slightly tender. Heart: No murmurs. Red blood corpuscles, 9,000,000; hæmoglobin, 120 per cent. Once a few hyaline casts. He grew drowsy, jaundiced, and cyanotic. Later, red blood corpuscles, 7,360,000.

Autopsy. Hypertrophy of left ventricle. Spleen, 1440 grammes; consistency normal. Brain congested. Suprarenal small, dark, soft. Thymus not noted.

Weil (*La Semaine Médicale*, June 29, 1901) has a brief note on two cases of hyperglobulism, with cyanosis, lasting from birth, in two children, one aged two years, the other four years. The blood count is not given. In one the spleen was enlarged, in the other normal. No heart disease.

Analysis of the Cases.

Six of the patients were males and three females. All were in the middle period of life, the youngest thirty-five years and the oldest fifty-three years. There was nothing in the occupation or in the station of life of any moment. The features may be considered in detail.

Cyanosis. Naturally this attracts most attention and has been the feature which has led to further investigation. As is usual in all forms of cyanosis, it is most marked about the face and hands, but in Dr. Lowman's case and in both of my patients the skin of the entire body was of a dusky blue. When first seen the suffusion of the conjunctivæ and the prominence of the eyes, as in Case I., may add to the startling appearance of the patient. The cyanosis is more intense in cold weather, and is aggravated by any existing bronchial catarrh. On bright, clear days, with but little moisture in the air, it may lessen

greatly, as in Case I. The period over which the cyanosis has been noticed varies from ten years (Case V.) to three or four years (Case I.). While constant, as a rule, it may vary greatly in intensity. In Case II. the patient usually came in very deeply cyanosed, the condition aggravated, no doubt, by the vomiting and the loss of liquids, but after a few days, when the bowels were moved, the color became less intense; but I saw this patient only the other day, some six weeks after his last attack of nausea and vomiting, and he was intensely cyanosed. There is no respiratory distress with the cyanosis. While the skin looks full and tense and the face and hands bloated, yet marked dilatation of the larger superficial veins is not noted. On close examination of the skin, many fine, dilated venules are seen.

Blood. The viscidity is greatly increased. All observers have remarked not only upon the unusually dark, but upon the thick and sticky character of the blood drop. An extraordinary polycythæmia is a special feature of the affection. The maximum blood count was 12,000,000 per c.mm. in Cabot's second case. In eight of the cases the count was above 9,000,000 per c.mm., and in the ninth (Case IV.) it was 8,250,000 per c.mm. There have been no measurements of the red blood corpuscles. The statement is made that in the polycythæmia of congenital heart disease the red blood corpuscles are smaller than in that of high altitudes. The percentage of hæmoglobin has been high, ranging to (in Case V.) 165. Usually the range has been from 120 to 150. In Case IV. it is stated to have been above the scale. The specific gravity of the blood in Case V. was 1080, and in Case II. it ranged from 1067 to 1083. In eight of the cases the leucocyte count ranged from 4000 in Case I. to 20,000 in Case VI. As a rule, in a majority of the cases it has been below 10,000 per c.mm. In Case II. on one admission the count reached 30,000 per c.mm.

Spleen. In seven of the nine cases the spleen was enlarged. In four of these the enlargement may be termed great, reaching nearly to the navel. In Case VI. there was no note. In Case II. it was not enlarged.

The liver was enlarged in Case V.

Urine. In seven of the cases a trace of albumin was noticed, with hyaline, sometimes granular, casts. In Cases V. and VII. there was no note on the urine. The specific gravity was usually low.

Pigmentation of the Skin. As might be expected from the prolonged existence of the cyanosis, the skin was noted to be pigmented in several of the cases (II., III., IV., VII., IX.).

Symptoms. The symptoms have been very varied. Most of the patients have complained of headache, weakness, and prostration. Headache was a prominent symptom in four cases, vertigo in four, constipation in four, pains in back and abdomen in three cases.

Attacks of nausea and vomiting were a special feature in Case II., and are mentioned as present in Case V. Cough and shortness of breath were each present in one case. Fever was not noticed in any of the cases. The pulse was noticed to be of high tension and the vessels sclerotic. There was no œdema of the skin. The torpor, mental and physical; the sensation of fulness in the head, with headache, vertigo, and in some cases nausea and vomiting, remind us of the symptoms to which mountain climbers and aeronauts are subject. Three of the cases were fatal. In Case IV. the patient died in collapse after a few hours of drowsiness. In Case VI. the patient died comatose, with cerebral hemorrhage. In Case IX. the patient became drowsy and died in coma. The autopsy in Case IV. showed the heart to be about normal, moderate emphysema of the lungs, with cyanosis and œdema and moderately enlarged spleen. In Case VI. there was passive congestion of all the viscera and hemorrhage from the middle meningeal artery. In Case IX. there was hypertrophy of the left ventricle, with congestion of the brain.

Remarks. *Chronic cyanosis*, a common enough feature in clinical work, is met with:

1. In organic disease of the heart, particularly in congenital malformation, in chronic myocardial and tricuspid lesions in children and adults, and in cases of adherent pericardium.

2. In certain diseases of the lungs, particularly emphysema, and in long-standing pulmonary tuberculosis of the fibroid type. Practically there are only two conditions in which patients walk into the hospital or into our consulting-rooms with extreme cyanosis, congenital heart disease, and emphysema.

3. In the methæmoglobinæmia of chronic poisoning with coal-tar products, as antipyrin and acetanilid, etc. In this condition, too, the patient may startle one by the markedly cyanotic appearance.[1]

There are a good many people whose normal condition is one of great fulness of the bloodvessels of the skin, so that in cold weather there may be marked cyanosis of the ears and of the face. We all know the stout, hearty, full-blooded man with rubicund face—the type which has been well described by Clifford Allbutt in his *Lane Lectures*—a common one among draymen and in men of that class, who live much in the open air and who drink freely. In them cyanosis, though not necessarily present, may be very marked in the face and hands when the temperature is low. As a rule, the peripheral circulation is

[1] I am sorry I have not got a blood count in a case of this sort. As a rule, there is anæmia; in a remarkable case which I saw with Dr. T. R. Brown, the hæmoglobin was only 50 per cent. Unfortunately no count was made of the red blood corpuscles. In the case of a physician with extreme cyanosis from long-continued use of antipyrin, a blood count was made, and I remember that the red corpuscles were not above normal, but I have not the actual figures.

active and the normal condition is a vivid hyperæmia of the skin associated with dilatation of numerous small venules.

Cyanosis, local or general, indicates one fact—diminished oxygenation of the blood corpuscles. In the deepest cyanosis of the ear or of the finger-tip the blood count may not be above 5,000,000 per c.mm. Only recently Dr. Futcher examined for me the blood of a red-faced, short-breathed Englishman, whose skin seemed fairly bursting with blood and whose fingers and ears were quite cyanosed. The red blood corpuscles were only just above 5,000,000 per c.mm. In the local cyanosis of Raynaud's disease the blood count may be very little above the normal. I have a patient at present in the wards in whom the blood count from the cyanosed foot ranges from 4,500,000 to 6,500,000; the count from the ears about 5,500,000 (Dr. Briggs). A few weeks ago, in Dr. Brayton Ball's wards of the New York Hospital, I saw an interesting case of coma (which turned out to be due to a fracture of the skull) with the most intense localized cyanosis in the fingers of one hand, active, vivid red hyperæmia of the fingers of the other hand, and normal-looking blood distribution in the ears. The count, very kindly made for me by Dr. N. B. Foster, was practically normal and the same in all three situations. Contrariwise, the anomaly may be present (though I must say it is rare) of a red face and general superficial hyperæmia with a very low blood count. During this session there has been under my care in Ward E a patient with what we have termed *anæmia rubra*. With a blood count of about 2,000,000 per c.mm. from ear-tip or finger-tip, he was as red as a beet, and it was not until his blood had fallen to nearly 1,200,000 that he began to present a typical picture of pernicious anæmia. On admission, with his blood at a little above 2,000,000, and looking the healthiest patient in the ward, he had nucleated red blood corpuscles. In the cyanosis of emphysema and the ordinary forms of heart disease, the number of red blood corpuscles per cubic millimetre is not, as a rule, much increased, and rarely reaches the limit of polycythæmia, which, as suggested by Cabot, may well be placed at 7,000,000. Occasionally most extraordinary cyanosis occurs in adherent pericardium, as in a case reported by me (*Archives of Pediatrics*, 1896) and in the case reported by Lorrain Smith and McKisack (*Transactions Pathological Society*, London, 1902). In the latter the blood count was 6,000,000.

Polycythæmia. There are two classes of polyglobulism—*relative*, in which the condition is due to a diminution in the quantity of the plasma of the blood, and *true*, in which there is an actual increase in the number of blood corpuscles. Much work has been done of late years on the subject. Relative polycythæmia is very common. It may be caused by a deficient amount of fluids ingested, which possibly may be the cause of polycythæmia of the newborn; more frequently

it is caused by loss of liquids, either by (*a*) sweat; (*b*) diarrhœa (by far the most common); (*c*) increased diuresis. (*d*) In another group of cases there is loss of liquids by secretion or transudation, as in narrowing of the pylorus with dilatation of the stomach, and in the constant loss of liquids from the blood in recurring ascites. It is interesting to note that in some of these cases the polycythæmia is of a high grade and may persist for months or even for years. It is not necessarily associated with cyanosis, as in cases of dilated stomach and in diarrhœa. There is also a toxic polycythæmia described in poisoning by phosphorus and carbon monoxide, which, too, is probably relative. The polycythæmia of vasomotor disturbances, such as has been determined by Becker, Thayer, and others after the cold bath and after violent exercise, also comes in this class. Where the much-discussed polycythæmia of high altitudes should be placed is by no means certain. While a number of observers hold that there is new-formation, the lack of oxygen acting as a stimulus, others believe that it is relative, and due to increased elimination of fluids from the body, or that it is entirely due to a large number of corpuscles in the peripheral circulation. Others, again, think it is entirely due to the effects of decreased atmospheric pressure. The microcytes, poikilocytes, and nucleated red blood corpuscles point to new-formation, but the question is still under discussion.

True Polycythæmia. Vaquez and his pupil, Quiserne (*Thèse*, Paris, 1902), limit to this class the condition in which with an increased formation there is a continued increase in the number of red blood corpuscles in the circulating blood. It is met with where there is difficulty in proper aëration of the blood, as in high altitudes, or in heart disease, congenital and otherwise; and also in the obscure cases of the form here under consideration. The polyglobulism is regarded as a mode of adaptation to the new conditions and a sort of functional reaction of the organism. Belonging to this group is the polycythæmia so readily studied in congenital heart disease, and described by Krehl, Gibson, and others. The figures often reach as high as 8,000,000 or 9,000,000, rarely so high as in the form discussed in this paper.

It is by no means easy to offer a satisfactory explanation of the polycythæmia with cyanosis here under consideration. It does not seem possible to connect it in any way with the moderate grade of enlargement of the spleen, and yet there are one or two observations in the literature which are of great interest in this connection. Rendu and Widal (*Bull. et mém. Soc. méd. des hôpitaux*, 1899, 3 s., xvi. 528) report the case of a policeman who had an attack of vomiting without apparent cause, with dyspnœa. The temperature was normal. Red blood corpuscles, 6,200,000; leucocytes, 6000. This count gradually

diminished. On examination, skin subicteric; cyanosis of face and hands marked, to a less degree all over the body. A tumor, evidently the spleen, reaching from diaphragm to iliac crest. Eventually ulcers developed on tongue and the liver became enlarged. Autopsy: Spleen adherent to diaphragm, fibrous on section, and filled with caseous masses.

Moutard-Martin and Lefas (*Société des hôpitaux*, 1899) have also reported a case of a woman, aged forty-nine years, with pain in the left hypochondriac region, emaciation, no ascites, no cyanosis, with enlarged spleen, slight albuminuria. The red blood corpuscles were 8,200,000, the leucocytes 31,428. At the autopsy the spleen weighed 750 grammes and contained large caseating nodules.

With our imperfect knowledge of the physiology of polycythæmia it would be premature to discuss at any length the pathology of this remarkable group of cases. We need:

1. A careful study of all forms of chronic cyanosis with polycythæmia, particularly those associated with heart disease and emphysema. (It is to be noted that the cases here reported have the highest blood count on record, much higher than the average in congenital heart disease or in dwellers at great altitudes.)

2. A more accurate study of the blood in this class of cases—the volume, the viscosity, the state of the plasma and the serum, the amount of hæmoglobin, the specific gravity, and the diameter of the corpuscles. As increased viscosity of the blood, with resulting difficulty of flow, seems the most plausible explanation of cyanosis, it is especially important to test the viscosity by accurate physical methods and to determine the relation of the number of corpuscles to the viscosity of the blood.

3. The relation of the splenomegaly to the cyanosis and polyglobulism should be carefully observed. It may not be anything more than the effect of the chronic passive congestion.

Future investigation will determine whether we have here in reality a new disease. The clinical picture is certainly very distinctive; the symptoms, however, are somewhat indefinite, and the pathology quite obscure.

AN ASPECT OF MODERN PATHOLOGY.[1]

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It is a truism to assert that the great progress made in pathology during the past century is the result of the study of cellular structure and activity. The close of the nineteenth century has witnessed no lessening of the interest of pursuit of this study; but it has seen arise an endeavor to penetrate more deeply into the nature and properties of cells through which their manifold acitivities are brought about. Armed with a rich harvest of facts and the methods supplied by physiological chemistry, investigators have attacked the question of the internal constitution of the cell with renewed vigor, and the degree of success of this effort is indicated by the strides made within the past two decades in unravelling the phenomena of immunity and allied states. The twentieth century has received from its predecessor a rich heritage of facts and principles relating to the intimate structure and function of cells, which is destined to yield a fruitage of great importance to physiology, pathology, and practical medicine.

I find myself in the enviable attitude of dealing with certain topics in experimental pathology of recent acquisition and somewhat obscure nature, possessed by the assurance that my audience can afford to dispense with an explanatory introduction because of its acquaintance with the newer facts of immunity in relation to pathology so brilliantly dealt with in Professor Welch's *Huxley Lecture.*

So many pathological phenomena have in the past been attributed to alterations of the blood, and recent discovery has added so largely to the list of the activities of this fluid, that one is tempted, as he views the wonderful properties with which it is endowed, to exclaim, with Goethe, "Das Blut ist ein ganz besonderer Saft." The manner of the solution of blood corpuscles brought about by alien serum is a well-known phenomenon that many years since, through the studies of Landois and others, was made to explain the unsuccessful and even disastrous effects of blood transfusion. More recent investigations have shown that by a process akin to artificial immunization to bacteria, a similar but more intense capacity of bringing about solution of blood corpuscles can be developed in blood serums which naturally do not possess this action, and increase of the power can be produced in serums in which it is already present.

[1] Read at the annual meeting of the Medical and Chirurgical Faculty of Maryland, April 24, 1903.

This solution consists in the liberation of hæmoglobin from the stroma of red corpuscles and its diffusion through the fluid—a process to which the name "hæmolysis" has been given. Careful observation of this phenomenon has shown that in many cases a state of coalescence of the corpuscles, to which the name "agglutination" is applied, precedes that of solution; and, further, that while these changes are often associated, yet one may occur in the absence of the other.

While, under normal conditions, the serum of an animal is without injurious action upon the corpuscles suspended in it, yet in certain pathological states the serum suffers an alteration through which its corpuscles are acted upon injuriously, are made to agglutinate, and even to undergo complete dissolution. Coincident with the appearance of this activity it often happens that the serum has acquired increased power of solution over corpuscles of a foreign nature; and this alteration in properties acquired by the serum is held responsible for the blood destruction that accompanies many of the infectious diseases, and is so apparent and serious a condition in certain diseases—*e. g.*, severe anæmias, the causation of which is still unknown.

In view of the acquisition of such new and hurtful qualities by the blood serum, the discovery in cultures of many kinds of pathogenic bacteria of hæmolytic and agglutinating substances for red corpuscles is a peculiarly welcome addition to our knowledge of blood destruction in disease. And while this knowledge has not led to the understanding of all forms of blood destruction, and has as yet failed to shed important light upon certain clinical types of severe and pernicious anæmia, we have obtained a new standpoint from which to view the so-called blood diseases that promises further progress in the near future.

It is common experience in science to find that accurate observation has preceded adequate explanation. The manner of action of bacterial agents upon red corpuscles, and our recently acquired knowledge of agglutination of cells in general, could not fail to suggest that certain kinds of thrombi are produced by a form of coalescence of corpuscles; and I was not, therefore, surprised to find unmistakable evidences of agglutination of red corpuscles in the bloodvessels of the intestine and other organs in typhoid fever, in the lung in lobular pneumonia, and in some other pathological conditions in man. That a similar form of thrombosis plays an important part in experimental pathology could be shown by studying the "clots" formed in the heart and great vessels in poisoning by ether, alien serum, and ricin injections in rabbits, and has been proven by the observations made by Fisher, working in Dr. Welch's laboratory, of the occurrence of such thrombi in experimental infections with the typhoid bacillus, and Boxmeyer,

of Boston, of their existence in relation with certain necrotic foci in the liver in experimental hog cholera bacillus infections. Heüter and Klebs and Welch had, many years ago, drawn attention to the fact that certain of the so-called hyaline thrombi appeared to be composed of fused and altered red corpuscles, observations which are confirmed and explained by these later findings.

It seems to me highly probable that agglutinative thrombosis will, in the near future, be recognized as an important pathological condition in man, and that a large number of the thrombi that arise in the course of infectious diseases and, doubtless, diseases of uncertain etiology, will be discovered to have originated in agglutination. Not only will capillary hyaline thrombi be explained upon this basis, but the thrombi of larger vessels, such as those of the femoral vein, may equally be shown to have this mode of origin. I wish, in this connection, to draw attention to the unsatisfactory nature of the data relating to the mycotic origin of thrombi with which French writers especially have identified themselves, and to suggest that in agglutination a more adequate cause for thrombosis might be found.

The experimental study of agglutination seems capable of shedding much needed light upon the subject of intravascular clotting in general. I have been able to show that the so-called coagula which appears in the heart in experimental ether and alien serum poisoning are not clots in a true sense, but merely masses of fused red corpuscles; and Ehrlich, many years ago, endeavored to explain the lesions of experimental ricin poisoning upon the basis of his findings of capillary thrombi composed of agglutinated corpuscles. Ehrlich's attention was called to this appearance by the previous observations of Kobert and Stillmark upon the precipitating and coagulating action of ricin upon red corpuscles *in vitro;* but the entire series of pathological effects of ricin upon the organism cannot, as I pointed out some years ago, be explained by thrombosis.

That relation exists between extensive blood destruction and agglutinative thrombosis, the mode of action of ether and alien serum injections in producing rapid death quickly proves; and the essential identity of the agglutination produced *in vitro* and in the body by agglutinating and hæmolytic substances can easily be shown. If a dog or a rabbit is injected with a fatal quantity of hæmolytic serum and the gelatinized blood in the heart and great veins be removed and subjected to immediate examination in the fresh state, the corpuscles will be found fused together and, under the influence of the pressure of a cover-glass, to undergo extraordinary changes in form and position. Anyone acquainted with the remarkable photographs of Mitchell and Reichert illustrating the effects of venom upon red corpuscles will recognize the identity of the two pictures.

The description of agglutination of corpuscles by venom given by Mitchell and Reichert, and later by Mitchell and Stewart in their papers on venom, and the studies upon venom recently conducted by Dr. Noguchi and myself, suggested a restudy of the intravascular clotting of blood caused by venom injections. We were fortunate in having several kinds of venom with which to undertake this investigation. It has long been recognized that the venom of the viper family, to which our rattlesnake belongs, is especially prone to cause vascular clotting. Beside crotalus venom, we have possessed other viper venoms, such as that of Russell's viper from India (*Daboia Russellii*) and *Trimere surus* from Japan. By far the most active venom in this respect is that of Russell's viper, as intravenous injections of it cause almost instantaneous "clotting" of the blood in the right heart, pulmonary artery, and vena cavæ. If these clots are removed immediately and examined (1) in the fresh state, and (2) after instantaneous hardening, no fibrin can be found. They consist exclusively of masses of agglutinated red corpuscles and are entirely free from evidences of clotting in the classical sense. But beside the change in adhesion of the corpuscles, still greater alterations of form and refraction have taken place in them; and sections of the "clot" from the heart and in the vessels of the lung, show extraordinary pictures of drawn and twisted bands of hyaline appearance which may readily be mistaken for modified fibrin.

These facts would seem to be of immense assistance in explaining the origin of certain thrombi met with in man in infections and other diseases which are attended by marked blood destruction and perhaps still other changes in the composition of the blood.

The light which the study of agglutinins has shed upon the general subject of thrombosis has served also to illuminate in no trifling way the path along which we are proceeding in gaining knowledge of certain forms of hemorrhage. It is customary to ascribe hemorrhage to two opposed conditions: to rupture of bloodvessels and escape of blood corpuscles through the vessels by diapedesis. Only the second mode of origin needs enlightenment. Hitherto we have been obliged to be satisfied with a vague and hypothetical molecular alteration of the vascular wall as explaining the increased passage of red corpuscles into the tissues. It would now seem that at least certain forms of parenchymatous hemorrhage are explicable in a more satisfactory and objective manner, and I will ask you kindly to turn your attention to this subject.

That no necessary relation exists between thrombosis and hemorrhage can be shown experimentally by removing from rattlesnake venom its agglutinins for red corpuscles, when the hemorrhagic principle is left unaffected, and that no relation exists between hæmolysis and hemorrhage can be inferred from the action of cobra venom, which, while

an active agent of blood destruction, causes but little hemorrhage. But the entire independence of the principles which act injuriously upon bloodvessels, and thus permit escape of blood, can also be shown by the use of ricin, which is non-hæmolytic and which, in rabbits, produces extensive extravasation of corpuscles into the serous membranes.

Jacoby and Müller have shown that ricin is not robbed of its entire toxicity by digestion with artificial gastric juice, and Müller made the observation that the agglutinin is destroyed in the process. I found no trouble in confirming this finding of Müller and in detecting that digested ricin is still capable of producing hemorrhage.

If the thin mesentery of the rabbit is spread out and prepared and the capillaries lying within the hemorrhagic areas are carefully studied, it will be seen that neither in venom nor ricin poisoning have the red cells become fused and lost their dependence, but the capillary walls have been injured in a definite and unmistakable manner. The extravasations take place not by diapedesis, as is now believed, but through actual rents in the walls. The explanation of the rents is of much interest. That they are not simple ruptures seems proven by the disappearance, as if through solution, of the parts of the wall at the site of the escape of corpuscles. The solution of continuity is one-sided, and in some instances is attended by a displacement of the adjacent endothelial cells, which are pushed outward, away from the vessel, by the force of the escaping blood. The escape of corpuscles by dissolution of the vascular walls is limited to capillaries and small veins. When acted upon by venom the vessels show irregular bulging of the walls, by ricin a localized dilatation or congestion of the vessels, which give rise to a glomerular appearance; but in a small number of places only does the extravasation occur. It is probable, therefore, that the points of injury to the vascular coat are many, but in a part only of these does the vessel give entirely away.

The existence, then, of a substance having an especial affinity for vascular endotheliun may be considered as proven for snake venom and ricin. For this principle, if principle it be, we have proposed the name of hemorrhagin, and we look upon it as a cytolysin for endothelial cells of bloodvessels, the injury and destruction of which is the direct cause of the escape of blood into the surrounding tissues. It remains to be shown whether such hemorrhagins are of common occurrence in nature and to what extent they may play a part in animal pathology. I regard this as a most promising field of future exploration, for I conceive that bacteria and other pathogenic micro-organisms probably produce endotheliolysins, and the action of hemorrhagins may be the immediate cause of the extravasation of blood in purpuric states and some other forms of so-called parenchymatous hemorrhage.

Should this view of the causation of hemorrhage be supported by

future studies, we may well consider the possibility of preparing experimentally an antidotal agent for the principle involved in its production. We already have at hand certain observations bearing upon this question. You are all familiar with antivenin as prepared by Calmette and Fraser as an antidote to venom. Although contrary to the generally prevalent opinion, it may be affirmed that the value of the commercial antivenin is in inverse ratio to the hemorrhage producing power of the venom. This fact arises from the consideration that in the preparation of antivenin cobra venom chiefly is employed, and it is almost devoid of the hemorrhagic principle.

Venoms which cause much hemorrhage exert a very destructive local effect upon the tissues. For this reason very little success has attended the efforts to produce an antitoxin for viper venom. On this account Dr. Noguchi and I have sought a means of modifying viper venom so as to remove the locally destructive effect and yet leave the value of the hemorrhagic principle with which an immunity might be established. Through the use of hydrochloric acid we have succeeded in getting rid of the local effects, including the hemorrhage, and yet have preserved the combining value of the hemorrhagic principle, so that successive injections in animals of modified venoms could be carried out. The serum of these animals contains an appreciable quantity of antihemorrhagin as well as other antidotal principles, and is capable of neutralizing the local effects of rattlesnake venom.

That antihemorrhagins, like other antitoxins, etc., could be produced experimentally must be inferred from Ehrlich's production of antiricin; for, although he failed to distinguish between the hemorrhagic and agglutinating principles in ricin, yet the neutralizing value of his antiricin seems to have included all the ricin principles.

If I have dealt somewhat fully with this topic it is, first, because of its importance to human medicine, and, second, because in its light I must regard the outlook for a better understanding of a very obscure, serious, and difficult pathological condition in man as of considerable brightness. Moreover, it may not be a Utopian dream, in view of what has already been gained, to look forward to the production of an antidote that, by neutralizing this poison for vascular endothelium, may provide a rational and certain therapeutic agent to combat this form of hemorrhage.

I shall ask you to turn to another aspect of my theme which relates to the occurrence under natural conditions, of a whole host of cell-destroying—cellulicidal—substances in blood serum which, up to now, have received almost no attention, and which I regard as not without significance to human pathology. When one considers the diversity of agglutinins and solvents for blood corpuscles, bacteria, and other cells, contained in normal serum or open to experimental production,

it will cause no great surprise to learn that the serum of warm-blooded and cold-blooded animals contains corresponding active principles for kidney, liver, and testicular cells. Dr. Noguchi and I have been engaged, during the past winter, in studying these cytotoxins and have found them to have a wide distribution and to possess a considerable degree of activity.

In view of the ever-increasing number of activities with which almost daily discovery is endowing our body fluids, the question of the independence and specificity of the constituent active principles has come to be an important one. In the studies under consideration we could show by means of absorption tests that the agglutinins and solvents for blood, kidney, liver, and testicular cells differ among themselves, and the removal of a part of them by means of certain of the cells does not prevent the action of the serum upon the remaining cells; from which it could be concluded that the principles are at least specially adapted to given cells. A general reduction in the activity of the serum which has lost a part of the solvents also suggests that they are not specific in the strictest sense.

It would carry us too far afield to discuss the different ways in which the manifold properties of serum may be explained; whether by supposing it to be a mine of diverse substances as rich as the endless activities which it exhibits, or whether its effects are produced by combinations and permutations among a smaller number of independent bodies. It is sufficient for the moment to have drawn attention to the multiplicity of the energies of serum in a relatively narrow circuit, in order that I may add a word upon what may not be an impossible form of activity, developed under pathological conditions within the serum.

In speaking of blood-destruction I emphasized the absence from serum under normal states of cytolysins directed against its own cells, and took under consideration the pathological conditions under which a destructive property was apparent. Whether similar harmful properties for the organic cells are developed in serum has not been considered especially; but, in view of the diverse activities of bacterial and other poisonous agents, they may be assumed to arise. But, just as not all the forms of blood injury can be ascribed to the action of exogenic poisons, it is worth while inquiring whether any conditions may arise under which the injurious power of serum may be directed against its bodily organic cells.

You will not have failed to appreciate the dangerous nature of the forces inherent in serum; but, fortunately for us, these implements of destruction are not turned against ourselves. The protection which the body exercises against its weapons of offence is aptly described by Ehrlich as "horror autotoxicus"—horror of self-poisoning. Were it

conceivable that the body should be withdrawn, for an appreciable interval of time, from the operation of this restraining force, we might, at any moment, be observed to run together and dissolve in our own juices! And yet is it wholly without the realm of possible accidents that in respect to some organs and in some degree this "horror" should be removed? I cannot convince myself that in the progressively degenerative lesions of the body—those of the liver, kidney, and brain, for example—where through years the process of destruction goes on, and where the reserve regenerative capacity normally present is held in check, that this "horror" may not be in abeyance.

The many observations upon the effects of isolysins and heterolysins —as for kidney and liver cells—about which there is no reasonable doubt, speaks, it seems to me, in favor of such a possibility. Dr. Pearce has studied through many months in my laboratory the action of nephrolysins, and has made observations of great importance with reference to experimental nephritis. The results of his studies will appear in due time, but I wish to refer to one fact brought out by his investigations that I think of special interest.

A large part of the studies were made upon dogs, and, by the way of preliminary observation, the urine was always examined before the experiment was begun. It was surprising to discover not infrequently albumin and casts in the urine of dogs apparently in the best of health; and on studying the kidneys to find marked degeneration of the epithelium, and focal accumulations of cells of the plasma-cell type, such as occur in man in a definite form of non-suppurative interstitial nephritis.

The blood serum of normal dogs infused into other healthy dogs produces no symptoms of disturbance of the renal function; but the serum of a dog with spontaneous nephritis gave rise to albuminuria and cast excretion, such as Dr. Pearce has observed in many instances of the infusion of the serum of the rabbit which had been treated previously with dog's washed kidneys.

That both iso- and hetero-nephrolysins set up the lesions of acute nephritis has been shown previously; but this observation of Dr. Pearce is of a different order. It must be considered either that some exogenic toxic agent set up the renal lesions in the first dog and was present in the animal's blood in such quantity that when its serum was infused in a second animal in the proportion of 1:500 of the body weight it sufficed to produce marked disturbance of the renal function such as is recognized in man as due to organic lesions; or that the degeneration of epithelium which may be assumed to exist in the first animal (which is still alive and under observation) provoked a series of changes with the production of toxic substances which for this animal are autotoxic and another animal of the same species isotoxic. It will not do to dogmatize about phenomena as complex as those we

are now considering; but if the second view expressed here is at all tenable, and it would seem to offer at least a rational explanation of the facts observed, we must admit the possibility, under pathological conditions, of the establishment of a vicious circle leading to progressive degeneration of organs which could come into play only by the temporary suspension of "horror autotoxicus."

But I must turn from such baneful and, at present perhaps, unprofitable, speculations. The whole subject to which they refer represents a field of future exploration. That it is a territory not without fascinations you will, I think, admit, and I am of the opinion that it is also a land of promise for the future of practical medicine.

The enormous advances made in the last decades in the study of the morphology of the cell are being paralleled by the gains in our knowledge of what may be called intracellular chemistry. This new knowledge is bearing the richest fruits, for among them are the newer conceptions of immunity and of the physiological and pathological activities of a whole series of intracellular ferments.

Looked upon broadly, the corner-stone of modern pathology is toxicology. Without entering into a discussion of the general subject, I may remind you that while definite chemical poisons, such as arsenic, morphine, strychnine, etc., are capable of inflicting great injury upon different organic cells, their introduction in repeated feebly toxic doses into the body is not followed by a reaction the results of which are the appearance in the blood and elsewhere in the body of neutralizing and antidotal substances. The case is wholly different with a series of less definite, chemically speaking, toxic agents, of which diphtheria and tetanus toxins, ricin and venom, and pathogenic bacteria and other cells, are examples, for when introduced into the living body in this manner, they give rise to antitoxic and destructive substances to which the names of antitoxin and cytolysin are being applied.

The precise manner in which these antagonistic bodies come to be produced is, for the present, purely a speculation; but the lateral chain hypothesis of Ehrlich, which attempts to supply a graphic conception of the manner of their formation has, whether expressing the truth or not, led to great advances in our knowledge. According to this hypothesis, the antitoxins, intermediary bodies, agglutinins, etc., are yielded by certain constituents of cellular protoplasm within the body, designated "lateral or side chains" or "receptors" which combine with the protoplasmic constituents of body cells, bacteria, or toxins used for immunization. This conjunction seems to injure or render useless the receptors of the cellular protoplasm without, at the same time, so seriously damaging the cell as to prevent regeneration. The regenerative process does not exactly restore the integrity of the cellular protoplasm; but, in keeping with the general law of regeneration

enunciated by Weigert, there tends to be formed similar bodies in excess. The excessive receptors or lateral chains, being useless to the cells in which they are produced, are cast off and appear in the body juices as intermediary bodies or "ceptors," which, according to their nature, are designated uniceptors (antitoxins, etc.) and amboceptors (intermediary bodies).

In antitoxic neutralization direct union between the toxin and antitoxin occurs; while in bacteriolysis and other forms of cytolysis there is conclusive evidence that, although the intermediary body unites first with the cells, this substance by itself cannot bring about injury or solution; but after its union with the cells the substance called "complement," normally present in the blood, is capable of being brought into action, whence the injury is inflicted. The action of the complement depends upon its possession of properties designated zymotoxic or toxophoric, through the influence of which hæmoglobin is set free from red corpuscles, various organic cells are dissolved, bacteria are disintegrated, and ciliar and flagellar motions are suppressed.

The intermediary bodies and complements upon which serum activity depends are contained within the blood; but there are certain kinds of natural poisons, of which venom is perhaps the best example, in which only the intermediary body occurs in the poison, the complements—the directly hurtful constituent—being supplied by the blood. I have already dwelt upon some of the principles of this poison, and I wish now to state briefly that venom possesses intermediary bodies capable of bringing into play complements which cause solution of many kinds of cells—those contained in nervous, renal, and hepatic tissues, and still other organs. All these solvents, as Dr. Noguchi and I have been able to show, possess a striking independence of action which cannot fail to excite great wonder at the complexity of venom, and aid in the understanding of the elective affinities which poisons exhibit for certain organs, to which not only is disease of these organs to be attributed, but the selective action of remedies ascribed.

My purpose in bringing again to your attention the subject of venom intoxication is to present a remarkable instance of interaction of two substances, both of which are poisonous, but one of which is capable of affording protection from the other—a therapeutic paradox which is explicable upon the basis of the mechanism of immunity as formulated by Ehrlich.

I have referred to the cytolytic action of snake serum, and I wish now to tell you that the blood serum of the rattlesnake, moccasin, and some other snakes is highly poisonous to warm-blooded animals. Dr. Noguchi and I have been able to show that the manner of action of the toxic principles of snake serum is comparable to that of venom, with, however, one very important difference. Both owe their poisonous

action to intermediary bodies; but the one, that of venom, is able to attach the complement necessary to complete the injurious system of the animal poisoned; while the other, that of serum, can combine only with its own complement. While, therefore, venom is active, even after heating to a relatively high temperature, serum is inactivated at the temperature (58° C.) at which its complement is destroyed. This temperature does not, however, affect the serum-intermediary body; and hence, while the heated serum is no longer toxic, because it cannot utilize a foreign complement, it is still able to unite through its intermediary body with cells for which it has affinity. This affinity is especially for nerve cells; and since the serum combines with the same lateral chains or receptors of the nerve cells that venom attacks, it is possible by using heated serum to prevent venom union. If, therefore, heated snake serum is injected into guinea-pigs they can be protected, for a time, from fatal cobra poisoning. The duration of this immunity is not great and its degree is not high; for, on the one hand, the normal metabolism of the cell modifies or destroys, sooner or later, the combined serum-intermediary body, and, on the other, an excess of venom can by mass action drive out the weaker serum constituents. This fact is brought readily into conformity with the belief that receptors are, after all, designed primarily not as organs to be used under stress of pathological necessity, but to serve the needs of physiological processes of nutrition.

Snake serum protection from venom had previously been observed by Phisalix and Bertrand, who endeavored to explain the phenomenon by supposing that antivenin was produced by the absorption of venom into the circulation of those animals. According to their view, the serum contains venom and antivenin; the first easily destroyed by heat, the second more resistant. Heating of the serum, while abolishing the venom activity, leaves that of the antivenin unimpaired, whence its protective action.

There is something highly artificial in this explanation which agrees, moreover, very badly with the facts. First, venom is destroyed at a much higher temperature than antivenin; second, the toxin and antitoxin of venom when brought together, whether in the circulation or in a test tube, tend to combine and neutralize each other; and, third, it is possible by replacement experiments *in vitro* to demonstrate the occupation of the receptors by the neurotoxins of serum and the consequent exclusion of the neurotoxic constituent of venom.

You will, I trust, pardon me for bringing before you a subject of such purely theoretical interest. My object in doing so is to indicate the aid which the chemical idea of cell and toxin unions is bringing into toxicology; but I shall not need to apologize deeply for this liberty, since in it may be detected a purpose in pointing the way

along which pharmacology and later therapeutics may be conceived to pass.

We have now traversed a considerable territory and one not wholly free from rough places. But the commanding position which we have reached and the breadth of view into the nature of pathological processes which has been secured justify, I trust, the undertaking; but having proceeded so far, it were vain to turn back until we had examined another field just opened up to physiological and pathological investigation, at the entrance of which we stand.

That organs protected from decomposition tend to undergo solution by a process of self-digestion was first accurately shown by Salkowsky in 1882. Within the last two years, and chiefly through the labors of Jacoby and Conradi, interest in this subject has been revived, and a number of important facts bearing upon physiological and pathological processes discovered. Autolysis, as the process is now called, has been studied from many different sides: the nature and the distribution of the active ferments; their multiplicity and specificity; their influence upon the coagulability of the blood, upon bacterial life, upon cellular degeneration under physiological conditions, and upon the resolution and absorption of pathological products, formations, and exudates. These studies have already shown that in the intracellular ferments causing autolysis we possess a most important and potent series of agents which come into play under both physiological and pathological conditions.

All that is required to convince one's self of the phenomenon of autolysis is to place a portion of the liver or other organ, or a quantity of exudate, under conditions protected from decomposition and maintained at blood heat, when digestion will proceed. Care must be exercised to avoid using means of preventing putrefaction that may injure unduly the ferments. Two kinds of autolysis are now distinguished: (*a*) antiseptic, in which it proceeds under chloroform or toluol water, and (*b*) aseptic, in which the organs are exposed in a sterile condition. Manifestly only the first method is applicable to certain pathological products in which bacteria are present. As a result of this self-digestion, the coagulable albumins are converted into non-coagulable proteid and certain by-products, among them leucin and tyrosin, make their appearance.

Differences are noticeable in the readiness with which autolysis of organs takes place under different pathological conditions. Jacoby found that liver autolysis was much accelerated in animals poisoned with phosphorus; and I have made some tentative experiments upon the rapidity with which organs from infected and non-infected human beings undergo this change.

Many of you will have been impressed with the remarkable softness presented by the liver, spleen, kidneys, and other organs in persons

who have succumbed to typhoid fever, peritonitis, septicæmia, etc. This softness has nothing to do with putrefaction, and I think it reasonably certain that it is the result of autolytic processes which may have begun to operate even before death. The changes through which the acutely swollen spleen, such as is met with in typhoid fever, goes, illustrates very well the manner of action of these ferments. The diffluent quality of the spleen in this disease quickly develops outside the body; and it can be shown to be independent of the post-mortem growth either of the typhoid bacilli or putrefactive bacilli. Every pathologist has seen a moderately firm spleen outside the body become soft and semi-fluid in a few hours; and I find that, reduced to pulp and placed under toluol water, the same change takes place.

In view of the resemblance of the hepatic lesions of advanced phosphorous poisoning to those of the liver in acute yellow atrophy, and the frequency with which the latter obscure disease supervenes upon acute infections, and, further, in view of the close agreement of the chemical products of degeneration of liver tissue in yellow atrophy with those of autolysis of the liver, the question arises whether the hepatic lesions in acute atrophy may not be the result of active autolytic processes set up by some agent that is as yet unknown.

The alterations in structure and consistence of muscle occurring in certain acute diseases (such as the so-called Zenker's degeneration, which appears in typhoid fever) have features in common with changes noted in autolysis. The softening and preparation for absorption of infarcted areas in the brain, kidneys, spleen, and other organs are also attributable to the action of intracellular ferments; and a similar form of softening occurs, if imperfectly, in malignant tumors, notably carcinoma, and in syphilis, where ferment-action possibly is accelerated through the use of drugs, of which potassium iodide is the most efficient in use.

On the other hand, not all dead tissues are subject to this digestive liquefaction and absorption. Tuberculous foci, though degenerated, are remarkably persistent; and, as Prudden has shown, undergo softening, probably only when certain bacteria invade secondarily the necrotic areas. It is of importance, in this connection, to recall that streptococci, which in themselves are not energetic tissue dissolvers, bring about softening and cavity formation in tuberculous foci; and the question as to whether their action is a direct one through products of their growth or an indirect one by causing an increase in autolytic ferments is pertinent, but not as yet to be answered.

Fresh pus obtained, let us say, from an empyema or fresh sputum, kept under toluol at the body temperature, becomes fluid, and a creamy layer collects upon the surface. The cells and nuclei disappear, and there appears in the fluid, as Naunyn first ascertained in 1865, various disin-

tegration products, among which are leucin, tyrosin, xanthin, guanidin, etc. Pus which thus undergoes digestion is capable of dissolving fibrin and even portions of organs independent of the action of bacteria. From this the conclusion can be drawn that pus, or really the leucocytes of pus, possess active digestive properties—a fact which the history of abscess formation and the removal by leucocytes of necrotic and other kinds of tissue, renders easily comprehensible. Many years ago Weigert attempted to explain, by assuming the operation of a peculiar poison which prevented fibrin-formation, the absence of fibrin from abscesses, etc., in which the fibrin factors must have originally been present. It is much more probable that what happens is a digestive transformation of fibrinogen, or of fibrin at the moment of its formation, by the ferments of the pus cell.

Broadly speaking, exudates and necrotic tissue are removed in two ways: first, by absorption, and, second, by organization. In the first mode disintegration and solution of the cells, etc., with the exception of the fat and certain other elements, such as pigment, take place and an emulsion results well adapted for entrance into the lymphatics. In the second, new vessels develop and invade the exudate or necrotic tissue, and, by supplying a fresh set of leucocytes to dispose of the offending material, it is finally removed. From what has already been said, the first series of changes will readily be recognized as caused by autolysis; but the operation of the same cause is not so apparent in the second series. And yet the two series are essentially the same. In the one the original material contains ferments of a kind and in a quantity sufficient to bring about the transformation which is necessary before absorption can take place; in the second, the ferments being originally insufficent are renewed by fresh leucocytes which emigrate from the vessels, load themselves with débris, and finally accomplish their entire removal.

There is little doubt that in many pathological conditions the leucocyte is the essential agent in bringing about absorption; and what is required to accomplish this end is not living leucocytes so much as large numbers of these cells, since autolysis proceeds independently of the vitality, as such, of the cells. The fate of pathological formations is dependent in large part on the numbers of leucocytes present within them. The different behavior of a caseous and croupous pneumonia, the facility with which the one, and the difficulty with which the other, undergoes resolution is to be ascribed probably to the absence in large measure of leucocytes from the tuberculous process and their presence in enormous numbers in the acute inflammatory condition. Other examples illustrating the importance of leucocytes in promoting autolysis and absorption might be given.

I have been interested for the past two years in studying autolysis of the exudate in the lung in two inflammatory conditions, namely, acute

lobar pneumonia and unresolved pneumonia. The pathology of the latter condition, except so far as the organization of the exudate is concerned, is, as you know, involved in the deepest obscurity. The study of the histology of the lung in various stages of the process of organization emphasizes one pathological condition, the import of which appears great in view of our present knowledge of autolysis: the exudate in unresolved pneumonia is fibrinous rather than cellular, and many of the alveoli of the lung are filled with dense, hyaline, fibrinous masses. All attempts to explain upon ordinary etiological grounds the peculiar changes, or absence of changes, in unresolved pneumonia have failed, and evidently the peculiarity of the processes is to be sought in other causes.

Friedrich Müller first studied autolysis of the lung in croupous pneumonia, and described in detail its occurrence and the chemical products, among which are lysin, leucin, tyrosin, purin bases, and phosphoric acid, of the digestive process. I have found that it is in the stage of gray hepatization that autolysis takes place quickly and perfectly, while in the stage of red hepatization it is very imperfect—a fact that can, I think, be attributed to the small number of pus cells present in the latter condition. But if the lung in unresolved pneumonia is exposed to conditions favoring autolysis the process is slow and incomplete as compared with what takes place in gray hepatization. In gray hepatization autolysis, after death, is a mark of the tendency, during life, of the exudate to become absorbed; in unresolved pneumonia the absence or reduction of autolysis is equally an indication of the future fate of the exudate, namely, during life to undergo organization.

I am, therefore, inclined to view unresolved pneumonia as an acute lobar pneumonia in which the inflammatory exudate, either because of some disproportion between the leucocytes and other constituents, or other cause as yet unknown, failing to autolyze perfectly, cannot be absorbed, and hence undergoes organization.

CONCERNING A POSSIBLE ETIOLOGICAL FACTOR IN TOBACCO-ALCOHOL AMBLYOPIA REVEALED BY AN ANALYSIS OF THE URINE OF CASES OF THIS CHARACTER.[1]

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In recent times the pathogenesis of the toxic amblyopias in general, and particularly the alterations which are produced in the ganglion cells of the retina and in the optic nerve by the action of quinine,

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methyl alcohol, and filix mas has attracted much attention. For a full consideration of the literature of this subject and the various views of experimenters and observers, the reader is referred to the papers of Holden,[1] Drualt,[2] Nuel,[3] Uhthoff,[4] Siegrist,[5] Uhthoff and Groenouw,[6] Nohl,[7] Birch-Hirschfeld,[8] de Schweinitz,[9] and Schieck.[10] Among these authors Birch-Hirschfeld, Siegrist, Uhthoff and Schieck have investigated the pathogenesis of chronic tobacco-alcohol amblyopia in human beings, and given the results of microscopic examination of specimens from cases of this nature. It is not, however, the purpose of the present paper to discuss whether the alcohol or the tobacco produces primarily a lesion in the optic nerve fibres or the ganglion cells of the retina; what significance should be ascribed to the vessel changes which have been demonstrated in the opticus, or whether the inflammation of the interstitial connective tissue of the optic nerve should be regarded as an essential cause of the disease, or only as an accidental condition, that is to say, whether the nerve degeneration in the optic apparatus is a primary one, or whether it is secondary to a proliferation of the interstitial connective tissue, but to attempt to throw some light on what the possible poison is which produces one or other or all of these changes, which in their turn interpret themselves by the clinical symptoms of this well-known form of amblyopia.

Writing on this subject in 1900, one of us (de Schweinitz[11]) said: "It is quite possible that nicotine, or one or more of the many principles freely present in tobacco-smoke, liberates some toxic influence in the system which must be held accountable for the disease, which, in other words, depends upon a species of *autointoxication*. Horner long ago contended that neither alcohol nor tobacco, as such, was the direct toxic agent in cases of central amblyopia, but that together these drugs produced chronic gastric catarrh, which in its turn established a chronic anæmia of the optic nerve, terminating in the pathological changes which are found in this disease. Sachs maintained that even in the pure tobacco cases certain complex chemical combinations occur in the stomach, and there was a resulting transformation of the normal gastric juices into acids of the fatty type, which combined with nicotine into

[1] Transactions of the American Ophthalmological Society, 1898.

[2] Recherches sur la Pathogenie d. l'amaurose quinine, Paris, 1900, and Archives d'Ophth., January, 1902, p. 19.

[3] The XIII. Congrès International de Médecine, Section d'Ophtalmologie, Paris, 1900.

[4] Ibid. [5] Archiv f. Augenheilk., March, 1900.

[6] Graefe-Saemisch. Handbuch der Gesamten Augenheilkunde, Zweite Auflage, 32, Lieferung, 1901.

[7] Beiträge zur Augenheilkunde, 1901, Heft xlviii. p. 51.

[8] Archiv f. Ophthalmologie, 1900, Bd. lii. p. 358; Ibid., 1901–1902, Bd. liii. p. 79; Ibid., 1902, Bd. liv. p. 68; Ibid., 1903, Bd. lv. p. 380.

[9] Ophthalmic Record, April, 1902.

[10] Archiv f. Ophthalmologie, 1902, Bd. liv. p. 458.

[11] System of Diseases of the Eye, edited by Norris and Oliver, vol. iv. p. 183.

substances which were more injurious than the simple tobacco bases themselves This observation is important in connection with certain experimental work under the direction of Dr. Casey Wood, not yet published, which indicates that certain stomachic toxins are capable of causing in animals blindness probably of the type now under consideration."

It therefore seemed to us that one method to approach this study was to submit the urine of patients suffering from tobacco-alcohol amblyopia to a thorough analysis, according to the methods of modern physiological chemistry, to regulate the patient's diet according to the findings until the normal standard in the excretions of the body was reached, and to note the effect of such treatment upon the amblyopia from which he suffered. Necessarily, such a research, in order to be satisfactory, would require the examination of a great number of patients and the observation of the effect of treatment over long periods of time, but even though the present communication is based upon an investigation of a few patients of this class, and though the observations cover a comparatively short time, they are reported with the hope that they may stimulate still further research along this line on the one hand, and on the other because they at least give an indication that Horner's views expressed years ago were not without foundation.

Case I.—A. F., male, aged forty-six years, American by birth, a negative retoucher by occupation, applied for treatment on account of failing vision September 2, 1902. There is nothing of importance in the family history, and in general terms he has been a fairly healthy man, except for some gastric disturbance, and he is free from syphilis. He has smoked for many years, but, according to his statement, never immoderately. He has been accustomed to drink beer, and occasionally whiskey, but has not been dissipitated in the sense in which that term is ordinarily used. In the spring of 1902 he noted blurring of vision which seriously interfered with his occupation and which was attributed to refractive error, the correction of which failed to bring about improvement.

Ocular Examination. V. of O. D. 6/30, D. = 1.50 was read with difficulty with + 2^s. The pupil reaction was normal, the media clear, and the optic disk a vertical oval with distinct pallor on the temporal side, especially in the region of the papillomacular bundle.

V. of O. S. 6/30, D. = 1.50 read at 25 cm. with + 2D with difficulty. The pupil reaction was normal; the media were clear; the disk was a vertical oval and was distinctly more pallid on the temporal side than elsewhere, and more pallid than the nerve-head in the opposite eye.

The form fields were practically normal, there was slight contraction of the red fields, and a faint negative scotoma in the centre of each field.

The patient was directed to discontinue smoking and drinking, and was ordered strychnine. At the end of a month there was absolutely no improvement in direct vision or the field of vision, and also no depreciation, and he was submitted to a thorough general examination, as follows:

There was slight dyspnœa, attributable to a moderate grade of emphysema, but otherwise the physical examination by ordinary methods was negative. The blood count showed hæmoglobin, 75 per cent.; red cells, 5,910,000; leucocytes, 11,700. The high counts were probably due to a slight cyanosis caused by his emphysema. Stained specimens of the blood were negative. Examination of the gastric contents after the test meal showed no free hydrochloric acid and a considerable amount of tough mucus, indicating the presence of chronic gastritis.

The urine examination was as follows:

	October 6, 1902.	*November* 8, 1902.
Amount	2280 c.c.	2176 c.c.
Indican	Extremely marked; unchanged by heat.	Negative.
Phenol	Negative.	Negative.
Acetone	Negative.	Negative.
Vol. fatty acids	191.4	114.8
NH_3 nitrogen	0.7404 gm.	0.5115 gm.
Total nitrogen	14.946 gm.	13.267 gm.
Preformed sulphates	2.311 gm.	2.095 gm.
Conjugate sulphates	0.4249 gm.	0.2897 gm.
Urobilin	Present upon extracting 15 c.c. of urine.	A trace upon extracting 80 c.c. of urine.

The patient was placed upon suitable diet, all medication discontinued, and at the end of six weeks, when the last examination was made and when there was practical disappearance of the abnormal conditions revealed by urinalysis, the vision with suitable correction had risen to 6/12 in each eye, the visual fields were normal, and the scotomas had disappeared.

Case II.—C. H., male, aged thirty-six years, American by birth, a merchant by occupation, applied for treatment June 6, 1902, on account of dull vision, which, however, was nearly normal with test types. The optic disks were congested, and there was a small capillary hemorrhage on the edge of the right disk. He was not seen again until September 19th of the same year, when there was marked increase in the blurred vision. The family history is unimportant. The patient denies syphilis. He has been an inveterate smoker for years and consumes great quantities of cigarettes. He also drinks freely, especially whiskey, and is not above the suspicion of having taken other drugs. In general terms, he has always been dyspeptic, exceedingly nervous, subject to vertigo and violent headaches, and was told that all of his symptoms depended upon uric acid.

Ocular Examination. V. of each eye 6/12, D. = 0.75 was read with difficulty. The pupil reactions were normal, the media clear, each optic disk was slightly congested, the retinal veins were rather full and the fibre layer of the retinas markedly streaked. A suggestion of pallor in the deeper portions of the optic nerves, especially on the temporal sides, was evident. The visual fields for form and red were normal in extent, and in the centre of each there was a small, almost circular, negative scotoma.

General physical examination, which was made by Dr. Alfred Stengel, revealed the following state of affairs: There was slight accentuation of his second heart sound, with some suggestion of beginning arterial change. There was no discoverable kidney change, either in the form of albumin or casts. There was a moderate degree of psoriasis, which

was attributed to his general systemic condition. The blood examination was negative.

The urine examination was as follows:

	October 7, 1902.	*October* 8, 1902.
Amount	375 c.c.	520 c.c.
Indican	Marked; lessened by heat.	Slight.
Phenol	Negative.	Negative.
Acetone	Negative.	Negative.
Vol. fatty acids	60.	62.4
NH_3 nitrogen	0.2184 gm.	0.1512 gm.
Total nitrogen	4.977 gm.	5.4739 gm.
Preformed sulphates	1.246 gm.	0.5724 gm.
Conjugate sulphates	0.092 gm.	0.0718 gm.
Urobilin	An intense band on the first washing and first extraction, which persisted to the third dilution.	An intense band on the first extraction, which persisted to the fourth dilution.

Commenting on this examination and others which he made, Dr. Stengel writes as follows: "There is a profound disturbance of food assimilation with reduction of its utilization. There is probably a marked disorder of the liver, which plays an important part in this metabolic inactivity. There is no evidence of any acid intoxication or uric acid diathesis, whatever that term may mean."

The treatment consisted in the regulation of diet and abstinence from tobacco and alcohol. At the end of a week vision had risen in the right eye to 6/6, in the left eye to 6/7.5, and D. = 0.50 could be read at 22 cm. The slight color scotomas were no longer demonstrable. Since this date the patient has not been seen.

CASE III.—R. J., male, aged fifty-two years, American by birth, a cook by occupation, applied for treatment in the Eye Dispensary of the University Hospital November 11, 1902, on account of failing vision, which had been particularly marked for ten weeks. In general terms, the patient had been a fairly healthy man; specific taint is denied. On July 8, 1902, his back was injured, although apparently not severely, by a fall, and he maintains that since that time he has had attacks of urticaria which came on in the evening and lasted until early morning. He has smoked excessively since he was fifteen, as much as two ounces *per diem* in a pipe, and has drunk whiskey to excess.

Ocular Examination. V. of O. D. 6/150, V. of O. S. 6/50. The media were clear, the optic disks vertical ovals, with marked pallor of their temporal sides; no changes in the retinal circulation or in the general expanse of the eyeground were present. The peripheral visual fields for form and red were normal, and in the centre of each there was a typical oval scotoma for colors.

The urine examination was as follows:

	November 17, 1902.
Amount	1675 c.c.
Indican	Moderate.
Phenol	Negative.
Acetone	Negative.
Vol. fatty acids	200.7
NH_3 nitrogen	0.2998 gm.
Total nitrogen	10.5867 gm.
Preformed sulphates	1.6757 gm.
Conjugate sulphates	0.2892 gm.
Urobilin	Slight band on first extraction.

The patient was exceedingly irregular in attendance; indeed, he returned but once after the urinary examination was made. At that time, namely, on November 15, 1902, vision was slightly better; O. D. 6/45, O. S. 6/22. The patient had not smoked; it is doubtful whether he stopped drinking. He had taken $\frac{1}{30}$ of a grain of strychnine three times a day. The effects of diet in this case could not be tried.

CASE IV.—O. M., aged fifty-one years, American by birth, a night watchman by occupation, applied for treatment in the Eye Dispensary of the University Hospital November 17, 1902, for failing vision which he had tried to remedy unavailingly by purchasing various kinds of glasses. In general terms, the family and personal history are negative; specific infection is denied. There was a large scar on the cheek, extending from the margin of the orbit to below the malar bone, which had been produced by the kick of a horse many years ago, and which had caused an ectropion of the right lower lid. The patient had been an incessant smoker for many years. He drank some beer, but, as he expressed it, "spirits mainly."

Ocular Examination. V. of O. D. 4/60, V. of O. S. 6/30, unimproved by glasses. The media were clear and the pupil reactions normal. The ophthalmoscope revealed vertically oval optic disks, with marked pallor of their temporal halves. The peripheral fields for white and red were normal, and in the centre of each field there was a large typically oval scotoma.

The urine examination was as follows:

	November 24, 1902.	*November* 28, 1902.
Amount	720 c.c.	1120 c.c.
Indican	Intense; less marked after boiling.	Slight.
Phenol	Marked.	Negative.
Acetone	Negative.	Negative.
Vol. fatty acids	59.	44.9
NH_3 nitrogen	0.4435 gm.	0.5644 gm.
Total nitrogen	6.773 gm.	11.101 gm.
Preformed sulphates	1.773 gm.	1.401 gm.
Conjugate sulphates	0.2432 gm.	0.2919 gm.
Urobilin	Slight band on first extraction.	Negative.

NOTE.—Examinations of this man's urine were made every day that he was in the hospital, for another purpose. The volatile fatty acids ran, for the first three days, between 60 and 95. After this they decreased to about 40. There was a constant decrease in the intensity of the reactions for phenol and indican. The total conjugate sulphates did not vary greatly.

The patient was placed upon the proper diet, and discontinued alcohol and tobacco. At the last examination in the Eye Dispensary, namely, on December 1, 1902, the vision of the right eye had risen to 6/30, and of the left eye to 6/22. Since this date he has not reported.

CASE V.—T. T., aged fifty-five years, American by birth, a laborer, applied for treatment in the Eye Dispensary of the University Hospital January 15, 1903, for relief from failing eyesight, which had been particularly marked in the last week. He denied recent illness of any kind, and there is no history of specific taint. He has been an incessant smoker for years. He denied the abuse of intoxicating drinks, but not their use.

Ocular Examination. V. of O. D. 6/45, V. of O. S. 6/30, unimproved by glasses. The pupillary reactions were normal, the media clear, the optic disk of each eye slightly blurred and discolored, especially upon

the outer side. The veins were dilated, irregular in calibre, and pressed upon by arteries which showed the stiffening of beginning endarterial changes. In the right eye below the temporal vein there was a small linear hemorrhage. The conditions of the left eye were similar but no hemorrhages were discovered. The peripheral visual fields for form and red were practically normal, and occupied in their centre by negative scotomas, the one on the right side being the larger.

The urine examination was as follows:

	January 22, 1903.
Amount	900 c.c.
Indican	Extremely intense.
Phenol	Negative.
Acetone	Negative.
Vol. fatty acids	54.
NH_3 nitrogen	0.5036 gm.
Total nitrogen	10.1462 gm.
Preformed sulphates	Not estimated.
Conjugate sulphates	0.3254 gm.
Urobilin	A distinct band on direct examination of the urine.

The patient was advised to stop tobacco and alcohol and was given a regulated diet. At the last examination, namely, on January 22d, vision in the right eye was 6/45, and in the left eye 6/22; therefore only a very slight improvement.

Case VI.—H. F., aged forty-one years, American by birth, a railroad employé, applied to the Eye Dispensary of the University Hospital on November 15, 1902, on account of failing vision, especially marked for the last week. There is nothing important in the patient's family history. Seventeen years ago he had malaria, but since then no other acute illness. He had hemorrhoids, which were successfully operated upon three months before he applied for examination. He had gonorrhœa many years ago, but there is no syphilitic history. He has used tobacco to excess and also whiskey, drinking sometimes as much as a quart a day.

Ocular Examination. V. of each eye 6/150, unimproved by glasses. Pupil reactions present, but light reaction slightly sluggish. Ophthalmoscopically there was evident a low-grade interstitial neuritis with perivasculitis on each side; the veins were full, uneven, and tortuous, and the arteries streaked with white lines. The visual fields were moderately contracted and there was entire lack of color perception, so that the presence of scotomas as such could not be demonstrated.

General physical examination failed to reveal any well-marked disease except in so far as the liver was concerned, which was distinctly enlarged. There was also a history of liver trouble for the last three or four years. The blood examination was as follows: Hæmoglobin, 83 per cent.; red blood corpuscles, 5,540,000; white blood corpuscles, 9600.

The urine examination was as follows:

Amount	900 c.c.
Indican	Extremely intense.
Phenol	Most intense ever noted.
Acetone	Negative.
Vol. fatty acids	37.2
NH_3 nitrogen	0.434 gm.
Total nitrogen	9.763 gm.

Preformed sulphates	Record lost.
Conjugate sulphates	Record lost.
Urobilin	A marked band on direct examination of the urine.

NOTE.—Repeated examinations were made during his stay in the hospital, and there was a constant decrease in the intensity of the urobilinuria and of the reactions for indican and phenol. Urobilin nearly disappeared by January 10th, and was quite gone by the 15th. The phenol and indican reactions were still positive when the man left, but less markedly so. The volatile fatty acids varied little and were always low.

The patient was admitted to the University Hospital on December 18th, and remained there until February 4th. The treatment consisted in suitable regulation of the diet, and, as required, saline purges and calomel. Visual improvement was manifest at the end of two weeks. By January 10th it had risen to 1/2 of normal, and on January 25th, or a few days prior to his discharge from the hospital, it was 6/5 in each eye. The visual fields were normal, and there was complete restoration of color perception.

CASE VII.—T. J. W., aged fifty-four years, American by birth, a bookkeeper by occupation, reported for treatment in the Eye Dispensary of the University Hospital July 9, 1901, on account of failing vision, which was marked for three weeks. His general clinical and family history is unimportant. Specific taint is denied, but the patient had used tobacco and alcohol to very great excess for years.

Ocular Examination. V. of O. D. 3/150, V. of O. S. 3/150. Media clear, pupils normal, and the optic disks round, the nasal edges hazy, the temporal halves gray, especially at the papillomacular areas. There was almost entire lack of color perception, the note on the book being that it was impossible to obtain fields for colors at all.

This patient continued to attend the Dispensary of the University Hospital, and took from time to time bichloride of mercury, iodide of potassium and strychnine, and stopped at once his tobacco and alcohol. There was a slow improvement, and when he first came under our observation, that is, on December 6, 1902, the field of vision for each eye was slightly contracted for form and red, and there was in the centre of each field a small central scotoma for all colors. The ophthalmoscope revealed marked pallor of the temporal half of each optic disk; indeed, there was distinct atrophy of the papillomacular bundle. Otherwise there were no changes. The visual acuity was O. D. 6/30, O. S. 6/15. The patient had not used tobacco or alcohol in any form for seventeen months.

The urine examination was as follows:

	December 10, 1902.
Amount	940 c.c.
Indican	Moderate.
Phenol	Marked.
Acetone	Negative.
Vol. fatty acids	152.2
NH_3 nitrogen	0.4421 gm.
Total nitrogen	9.6594 gm.
Preformed sulphates	2.2458 gm.
Conjugate sulphates	0.1748 gm.
Urobilin	A band on extracting 30 c.c. of urine.

NOTE.—A second examination, made December 24, 1902, showed no indican; no phenol; conjugate sulphates, 0.1253; volatile fatty acids, 60.4; urobilin, absent.

A third examination, made February 27, 1903, showed normal conditions.

All medication was stopped, the patient placed upon strict diet, and on February 14, 1903, or two months after treatment, the vision of the right eye was 6/12, and that of the left eye 6/15, a slight improvement in the right eye and stationary vision in the left. The patient, however, was quite sure that his vision was better, that is to say, as he walked the streets and in his ordinary occupation, and this improvement in vision corresponded with the restoration of the normal conditions in the urinalysis.

The methods adopted in order to determine whether recognizable signs of any intoxication were present in the first case examined (Case I.) were as follows: The blood corpuscles were counted, the hæmoglobin was estimated, and stained blood smears were examined. The blood pressure was determined with Stanton's modification of the Riva Rocci instrument. The stomach was inflated and the stomach-contents were examined. The feces were examined, and the urine was examined for albumin and sugar. The degree of intestinal composition was investigated by determining quantitatively the preformed sulphates and the conjugate sulphates (Baumann-Salkowski method), the volatile fatty acids (Blumenthal's method), and by determining the intensity of the qualitative reaction for indican (Obermayer's reagent) and for phenol (bromide test of the distillate). Urobilinuria was also looked for, and its intensity was approximately determined by Riva's method. Tests were made for acetone in the distillate and the ammonia nitrogen and the total nitrogen of the urine determined, in order to see whether there was any evidence of acid intoxication. The same methods were subsequently used, as far as possible, in examining all the other cases.[1]

The examinations of the blood and of the blood pressure were wholly negative and need no further comment. The examination of the feces also yielded nothing of consequence. The stomach-contents could be examined in only five cases.[2] All these five cases, however, showed marked evidence of chronic gastritis. Cases I., IV., V., and VI. all showed an acidity, with much mucus and very poor digestion of the test meal. Case VII. showed similar conditions, and differed only in that there was a slight acidity (15) and a faint reaction for free HCl. There was no noteworthy disturbance of motility in any of these patients; none had glycosuria. Albumin was absent in all instances, except that Case VI. showed a trace for a time. This disappeared, however, while he was under observation. There was also no evidence of acid intoxication in any instance, so far as exhibited in the results for acetone and ammonia. The determinations of the intestinal decomposition products and of the urobilin showed much more marked abnormalities. The

[1] All of the chemical examinations and general medical examinations were made by Dr. Edsall.

[2] Case II. was not under Dr. Edsall's personal observation, and Case III. did not return for examination.

results are given in the urinalysis appended to each case history, acetone, ammonia, and total nitrogen being included in the tables.

These conditions as compared with the normal are, in brief, as follows:

In Case I. there were at first very high figures for conjugate sulphates, but at the second examination nearly normal conditions: intense indicanuria at first, which disappeared; slight urobilinuria at first, which disappeared; the figures for the volatile fatty acids, at first very high, approached the normal at the second examination.

In Case II. there was an intense urobilinuria. The results for the sulphates and volatile fatty acids were negative, but the figures for the quantitative determinations are unreliable, as they are so low that it is probable that the urine was not carefully saved.

In Case III. there was moderate urobilinuria and the volatile fatty acids were extremely high.

In Case IV. there was a moderate urobilinuria, a marked indicanuria, and a decided reaction for phenol, all of which disappeared quickly under treatment. The volatile fatty acids tended toward the high limit of normal figures. The conjugate sulphates were constantly somewhat high.

Case V. showed an intense indicanuria, a moderate increase of the conjugate sulphates, and a marked urobilinuria. He gave no opportunity for a second examination.

Case VI. was not specially examined until he had been in the ward a week, when his vision had somewhat improved. At first he showed intense urobilinuria and indicanuria, and a most intense reaction for phenol. The records for the sulphates have been lost. Under treatment, there was a gradual decrease in the intensity of all these reactions, and some time before he left the hospital the urobilinuria had disappeared entirely. The reactions for indican and phenol, though still present, were much less marked.

Case VII. showed at first a marked reaction for phenol and notably high values for volatile fatty acids, with a slight urobilinuria. Subsequently these abnormalities entirely disappeared.

In three of the cases examined (Cases I., III., and VII.) the volatile fatty acids were very high. In Case II. they were relatively high, and if the urine had been carefully saved they would probably have been absolutely high. This made it seem possible that the absorption of excessive amounts of volatile fatty acids had had something to do with the amblyopia—a suspicion that perhaps might be increased by Kraus' report of retrobulbar optic neuritis in his two cases of cryptogenic acid intoxication. It is possible that there is something in this view, as the figures in Case IV. are also somewhat high, and the urine of Case VI. was examined only when he had already improved, and it

is possible that he would have shown an increase earlier. Case V., however, definitely showed a normal condition of the volatile fatty acids. The actual results, therefore, are, at best, doubtful as to this point. An experimental study of the effect of the prolonged administration of acids, particularly of some of the fatty acids, might be of value.

The results in general show that there was in all cases (except, perhaps, in Case II., in which the results are unreliable) an excessive excretion of enterogenous decomposition products in the urine; and in all there was a more or less marked urobilinuria. In all the patients repeatedly examined these abnormalities nearly or quite disappeared under treatment, coincidently with improvement in the eye conditions, as follows:

In Case I. there was absolutely no improvement in vision under the ordinary strychnine and potassium treatment. At the expiration of six weeks of special dietetic regimen, or when the results of urinalysis approached the normal standard, vision had risen to 6/12, or double that which it was at the first examination, and the scotomas disappeared.

In Case II. vision, which had fallen to 1/2 of normal, regained the normal standard at the end of one week of treatment, the patient being confined to a room in the hospital where he was under strict surveillance, and when there had been improvement in the abnormalities revealed by urine analysis. The doubt in regard to this case has been recorded.

Case III. showed slight improvement in vision at the end of five days, which, however, cannot be attributed to any influence of diet and alteration in the habits, inasmuch as the patient had been exceedingly irregular in attendance and probably did not stop drinking, although he did stop smoking for at least a week.

Case IV. exhibited a moderate improvement in the vision of the right eye and a slight improvement in the vision of the left at the expiration of two weeks under the influence of dietetic management. Since this date he has not reported.

Case V., who was under somewhat irregular observation for only seven days, showed a very slight improvement in vision.

Case VI., the most noteworthy of the series, regained with the restoration of a normal urinary analysis complete visual acuity. It is, moreover, noteworthy that although there had been a slight improvement in vision before the urine analyses were made, that is, after one month of dispensary treatment and one week of hospital treatment, during which time the patient probably entirely abstained from alcohol and tobacco, the marked restoration of central acuity of sight exactly corresponds with the restoration to the normal or nearly normal standard of urinary analysis.

Case VII., who had not used tobacco or alcohol for seventeen months before he was submitted to the analyses which have been described, is

noteworthy because, although the test types failed to reveal much improvement in sight, that is, only from 6/15 to 6/12, the patient was so certain that his general vision had improved that he was willing to continue the strict diet on which he had been placed. That he could not expect much visual improvement was evident on account of the permanent atrophy in the papillomacular bundle.

In this connection, it is proper to refer to a patient with moderate, almost stationary optic nerve atrophy, who has been coming to the dispensary for years, his original examinations having been made ten years prior to the present time. The etiology of the optic nerve disease could not positively be determined, but apparently it was not due to the abuse of alcohol and tobacco, as the man has been for many years a total abstainer. He therefore was used as a control and showed entirely negative conditions. There was very slight reaction for indican and none for phenol. The volatile fatty acids were 50.4, the NH_3 nitrogen 0.1412 gm. The sulphates were not estimated.

In these cases of toxic amblyopia there were evidences of a marked disturbance of digestion or of metabolism, or of both; furthermore, this disturbance may persist for a long time after the use of alcohol or tobacco has been stopped, as in Case VII., and the study of Case I. apparently indicates that treatment of this secondary nutritive disturbance will cause improvement in a persistent amblyopia. These facts, we think, give just ground for the belief that toxic substances produced in the digestive tract, or in the course of metabolic processes, have, at least, a certain part in the production of the amblyopia in most of these cases; and that at times they are probably the direct cause of the continuance of the symptoms when the latter do not disappear after alcohol and tobacco have been stopped. We do not think that more should be claimed from these results.

This view is entirely in consonance with the results of investigations concerning the manner in which other toxic effects of alcoholism are produced, and it also accords with our knowledge of the effects of some other chronic poisonings. There are, for instance, excellent reasons for the belief that many of the cerebral and other nervous symptoms in lead poisoning are not due directly to lead itself, but to nutritive disturbances set in motion by the lead. In the cases herein described it is quite evident that there was a marked disturbance of the alimentary tract; the disturbance was not, however, confined to that tract. Cases IV., V., and VI. all showed easily recognizable enlargement and some tenderness of the liver; and all had marked urobilinuria. All the others examined likewise had some urobilinuria. In the three cases just mentioned, therefore, and perhaps in others, there was disorder of the liver as well as alimentary tract disturbance.

SITOPHOBIA, INANITION AND THEIR TREATMENT.[1]

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By his studies in alimentotherapy, which owes its introduction to his efforts, von Leyden has achieved immortal fame in medicine. The same may be said of S. Weir Mitchell, who at an earlier date published his well-known food and rest cure in the treatment of neurasthenia. Von Noorden followed with classical monographs on diseases of metabolism, showing that an adequate nutrition is of the greatest importance in the treatment of chronic affections. Many clinicians, including myself, followed in the footsteps of the above authors. In 1893 I wrote an article entitled "Dietetics in Diseases of the Stomach,"[2] and later another, "The Diet of Dyspeptics,"[3] in which I emphasized that sufficient nutrition and frequently, in fact, overnutrition were essential in the cure of a great many invalids.

This proposition at first sight seems so self-evident that a discussion of this subject would hardly be considered necessary. In reality, however, even physicians frequently sin against this fundamental truth of dietetics—*i. e.*, sufficient alimentation. I have, therefore, thought it worth while to report on this subject from an extensive clinical experience, in order to illustrate the great importance of dietetics and its application.

1. By the term sitophobia we understand a condition in which too little food is taken on account of fear. This fear relates to pains or disagreeable sensations in the digestive apparatus arising after meals. To avoid these, patients prefer not to eat, or rather to eat as little as possible. Sitophobia is most common in chronic affections of the digestive system, accompanied by pains (gastralgia and enteralgia). These are usually ascribed by the patient to various foods, and in order to avoid the pains, they exclude at first the coarser and later even easily digestible articles from their dietary, taking finally only small quantities of milk or broths. Sometimes sitophobia arises in consequence of an abnormal sensibility of the gastric mucous membrane (hyperæsthesia ventriculi). This is but another variety of the cases just described; for even if in hyperæsthesia of the stomach no severe pains are experienced, yet the ingestion of food causes disagreeable sensations which the patient is anxious to avoid.

A further group is formed by those cases in which patients from false ideas, in the absence of pain, avoid food or limit its amount. Thus

[1] Read before the American Gastroenterological Association, May 14, 1903, at Washington, D. C.

[2] Dietetics in Diseases of the Stomach. Medical Record, June 24, 1893.

[3] The Diet of Dyspeptics. Ibid., January 1, 1898.

especially sufferers from intestinal disorders,[1] afflicted with constipation or diarrhœa, are afraid to eat heartily, because they think that the condition would be aggravated. To this class also belong all cases in which the patient for some reason or other on account of a certain ailment eats too little in quantity or variety, as, for instance, gouty people avoiding all meats, obese persons who do not take fats or carbohydrates, thereby injuring the organism.

R. von Hoesslin[2] regards sitophobia as a psychical condition. He says: "Such fears are not possible in perfectly normal people; for the expression 'phobia' presupposes the existence of an abnormal fear, based upon false ideas. If this fear is not abnormal, but justifiable—if, for instance, a patient suffering from acute enteritis is afraid to eat cabbage or prunes, or if a person who is always affected with urticaria after partaking of strawberries or lobster avoids these dishes—then we do not have to deal with a so-called phobia, but with a very sensible train of reasoning; but if this fear is abnormal, some psychic change has taken place. Sitophobia is, therefore, like all other phobias, of cerebral origin."

With reference to these remarks of von Hoesslin, I would reply that sitophobia is certainly found in people who do not suffer from any psychic disturbance. The patients are afraid to eat because they have pain afterward. This fear is justifiable; but in order to effect a cure it must be overcome, and, therefore, the treatment of this symptom (sitophobia) plays an important part.

Sitophobia, if left alone, leads to a partial, sometimes nearly total, inanition. A consideration of these conditions is, therefore, not out of place here.

2. Inanition means loss of strength owing to deficient nutrition. This expression was first used by Chossat[3] to designate the atrophy resulting from total abstinence. According to Samuel,[4] we must distinguish between complete and incomplete inanition.

Complete inanition of short duration (twelve to twenty-four hours) is often noted, as, for instance, in travellers who do not find an opportunity to obtain food during a voyage; also on fast days that are observed by many persons for religious reasons.

Signs of weakness and various nervous symptoms (pains in the neck, severe headaches, vertigo) develop early and are especially marked after severe exertions. Prolonged periods of fasting are undergone either by shipwrecked people or by special professional fasters. The latter have been made the subject of important scientific investigations during the

[1] Sitophobia of Enteric Origin. Journal of the American Medical Association, June 15, 1901.

[2] Bemerkungen zu Dr. Max Einhorn's Artikel über Sitophobe intestinalen Ursprungs. Zeitschr. f. diätetische u. physikalische Therapie, 1902, Bd. v. p. 529.

[3] Recherches expérimentales sur l'inanition, 1835.

[4] Eulenburg's Encycl. der Med., Bd. x. p. 320.

last twenty to thirty years. Our knowledge of metabolism during inanition is now almost complete, thanks to the labors of Zuntz and Lehmann,[1] Luciani,[2] and others.

It has been shown that during complete inanition the organism takes up as much oxygen as during normal rest—*i. e.*, after digestion is completed, for during the latter state an increased amount of oxygen is utilized owing to the augmented activity of the digestive apparatus. During inanition the body consumes its own substance in order to maintain its temperature and its chief functions. It lives on its own flesh and fat and does not economize any more than normally.

According to von Noorden,[3] the body during total abstinence burns up about 1 gramme of albumin and 3.5 grammes of fat per day and kilo of bodily weight. Samuel describes the symptoms of complete inanition as follows: "The feeling of hunger is most intense after twenty hours, and disappears after that; the feeling of thirst, however, remains until death. The mucous membranes become dry; weariness, weakness, and faintness are pronounced. The loss of weight is continuous. The mental faculties remain clear until the last. Sub finem vitæ albumin and mucin appear in the urine. The temperature sinks to 30° C. during the last twenty-four hours, and death occurs amid extreme prostration, deep coma, at times delirium and convulsions. During absolute abstinence death supervenes between the twelfth and twentieth days. If water is taken, life may be sustained for forty to seventy days. Forty per cent. of the bodily weight is usually lost before death."

Incomplete inanition or subnutrition is frequently met with. In relatively few cases we have to deal with conditions in which the organism is unable to utilize larger amounts of food (carcinoma cardiæ, seu ventriculi, seu pylori—extreme degrees of benign stenosis of the pylorus, infectious diseases during the febrile period). In most cases of subnutrition, however, we have to deal with conditions in which the organism would be perfectly capable of utilizing food if it were supplied to it. These are, therefore, conditions in which amelioration is possible.

Subnutrition begins as soon as the usual amount of food is diminished. The daily physiological quantity of food is about 100 to 130 grammes of albumin, 70 to 120 grammes of fat, 350 to 400 grammes of carbohydrates, 2500 to 3000 grammes of water, and 14 to 32 grammes of inorganic salts. Besides we inhale 744 grammes of air. The total amount of new material that is daily ingested is about 4 kilos, or about one-fifteenth of the total bodily weight. Expressed in calories, the body needs daily for each kilo about 35 to 40 calories during rest and 40 to 50 during hard work. If less food is taken an incomplete inani-

[1] Bericht über die Ergebnisse des an Cetti ausgeführten Hungerversuches. Berl. klin. Wochenschr., 1887, p. 42.

[2] Das Hungern., 1890.

[3] Berl. Klinik., 1893, Heft 55, p. 1.

tion results, which manifests itself by anæmia and loss of weight. Incomplete inanition, qualitatively—as, for instance, total abstinence from water, even such as occurs in solid food—leads, according to Samuel, to death just as quickly as complete inanition. On a purely albuminous diet the body fat disappears, and on a diet consisting of fats or carbohydrates alone the bodily albumin diminishes. A diet deficient in salts is badly borne. Digestive disturbances arise and nervous symptoms (trembling, muscular weakness) and death follow.

In practice we meet less often with a one-sided subnutrition (one deficient in a qualitative way) than with general subnutrition. The latter is encountered in the greater number of dyspeptics. I would like to cite here some examples from my practice as I meet them every week, in fact almost daily, in order to show how much less food dyspeptics take than the physiologically required quantity:

Case I. (March 15, 1903).—Mrs. Sadie M., aged thirty-eight years, complains for the last six years of pains about half an hour after meals, and much belching. She weighed formerly 168 pounds, and has decreased to 100 pounds in five years. She feels weak, without energy, sleeps poorly, and has pains after meals. She fears to eat on account of pain. During the last four months she has lived as follows:

8 A. M.	One cup of milk (200 c.c.)	128 calories.
	One slice of stale bread (30 g.) without butter	64 "
12 M.	One-quarter pound of steak	125 "
	One potato (25 g.)	22 "
	Occasionally a half slice of stale bread	32 "
5 P. M.	One-eighth pound of steak	62 "
	Two slices of stale bread	128 "
		561 calories.

The patient took daily per kilo weight 12⅕ calories.

Case II. (September 24, 1902).—Mrs. F. H., aged thirty-eight years, complained for two years of a feeling of constriction in the upper abdominal region. Appetite was increased, bowels were regular. During the last year she has lost twenty-five pounds (weighing originally 120 pounds and going down to 95 pounds).

She felt very weak, being hardly able to walk up stairs. During the last year the bill of fare of the patient was as follows:

8 A. M.	One chop (30 g.)	87 calories.
	Thin slice of bread (30 g.)	64 "
	Some butter (5 g.)	42 "
	One cup of coffee with very little milk (30 c.c.)	20 "
10 A. M.	One cup of broth (200 c.c.)	10 "
12 M.	Meat (100 g.)	213 "
	Potatoes (50 g.)	63 "
	String beans (30 g.)	100 "
	No bread.	
3 P. M.	Cup of coffee with a teaspoonful of milk	3 "
	One slice of bread (30 g.)	64 "
7 P. M.	Steak (100 g.)	213 "
	One slice of bread (30 g.)	64 "
	A little butter (5 g.)	42 "
10 P. M.	Claret and one cracker (10 g.)	35 "
		970 calories.

The patient was therefore taking food of a nutritive value of 22⅕ calories per kilo daily.

CASE III. (March 6, 1903).—Lena F. began to suffer a year ago from pains in the stomach, occurring one hour after meals. She was told by a physician to fast six days—*i. e.*, not to take anything at all at first and later only a little liquid food. She did this and was reduced from 100 pounds to 80 pounds. Afterward she slowly recovered and felt quite well for several months; she gained in flesh so that she weighed 104 pounds. About four months ago the patient began again to experience pain in the stomach after meals; she ascribed this to various articles of food, and gradually eliminated one after the other from her dietary. She steadily lost in flesh and weighed but 89 pounds when she first consulted me. Her diet then was as follows:

8 A. M.	One slice of toast (30 g.)	64 calories.
	One cup of milk (200 c.c.)	128 "
10 A. M.	One cup of beef-tea (200 c.c.)	13 "
12 M.	One plate of soup (200 c.c.) with rice (30 g.) or barley	100 "
	One thin slice of bread (30 g.)	64 "
	One ounce of scraped beef	30 "
3 P. M.	One cup of milk (200 c.c.)	128 "
	Two crackers (20 g.)	70 "
	Some butter (5 g.)	42 "
6 P. M.	Beef-tea (200 c.c.)	13 "
	One slice of bread (30 g.)	64 "
	Scraped beef (30 g.)	30 "
	One saucer of farina (100 g.)	182 "
10 P. M.	One cup of malted milk (200 g.)	128 "
		1056 calories.

As patient weighed 89 pounds, she was taking on an average a daily amount of 26.4 calories per kilo.

These three cases suffice in order to show how gravely the nutrition of the organism must suffer if for long periods on an average only about two-thirds (sometimes even one-third) of the food necessary to maintain the equilibrium is taken. If we study the above figures nobody will be surprised that such patients steadily decline and complain of weakness and various nervous disturbances. What is rather to be wondered at is the fact that such patients linger so long in their miserable condition and do not succumb sooner.

TREATMENT. In complete inanition lasting twenty-four hours or longer, the treatment consists in carefully administering easily digestible fluid or semifluid food in not too large amounts. It is quite natural that the famished are inclined to devour greedily any food that is accessible. If, however, they take too much or too coarse food it readily causes serious trouble in the exhausted intestinal tract. The chief duty of the physician, therefore, consists in proceeding with caution and restriction with regard to the taking of food during the first few meals. If after eating the exhaustion of the patient has disappeared he may then return to his usual mode of life.

The treatment of incomplete inanition or subnutrition is altogether different. Here we must first combat sitophobia, if it exists, because otherwise the existing malnutrition can hardly be removed. It is

important to encourage the patient to eat in spite of the pain. Usually the latter is in reality not so severe, and in nearly all cases we will succeed after a while in banishing the fear of food. Soon the patient can take ordinary nourishment. Even articles of diet which formerly caused severe pain are now tolerated without difficulty. The stomach, or rather the intestinal tract, seems to accustom itself to the greater demands made upon it.

It is, of course, advisable in some cases at the beginning of the treatment to diminish the sensitiveness of the digestive apparatus by bromides or similar drugs. These medicines are, however, not essential, but rather bridge over the first few days by facilitating the carrying out of the directions in regard to eating.

Another point of great importance is to improve the nutrition of the patient. At first we have to see that the patients take as much food as is necessary to maintain their equilibrium, and that no loss of weight occurs. This alone, however, is not sufficient for a complete cure; for many of these patients are very much run down, and while they will not lose any more weight with an amount of food that is just sufficient for their needs, they will, however, remain in their weakened condition. It is, therefore, very important that an increased quantity of food should be given, in order to make the patient gain in weight.

At first sight the accomplishment of this seems hardly possible. In reality, however, it is not so difficult, and can easily be done in most dyspeptic conditions (except carcinoma of the stomach and bowel).

In laying out a plan of alimentation the following points should be considered: The first change in diet must not be too great. If we have to deal with patients who have lived for a long time on fluid food only it is best to begin with liquid or semisolid food, as, for instance, milk, beef-tea, raw eggs beaten up in milk, or broths, strained barley or oatmeal soups, gruels, and jellies. We must, however, see that a sufficient quantity of nourishment is taken. This light transitional diet should be increased daily by some article or other approaching more nearly to the ordinary bill of fare. At first soft-boiled eggs, zwieback, tender meat, mashed potatoes, white bread, butter; later, light vegetables, boiled fruits, etc., are added.

As soon as the patients partake of the usual articles of food they should be instructed to eat about as much as their neighbors at table, only taking more butter (at first one-eighth, later one-quarter pound daily), and taking a glassful of milk and a slice of buttered bread regularly between meals. With a diet like this we succeed nearly always in obtaining an increase in weight. Thus in all the three cases mentioned above, which have been picked out at random from my journal, the patients gained even in the first few weeks after beginning this regimen.

The first case (Mrs. Sadie M.) gained two pounds the first week; the second (Mrs. F. H.) fifteen pounds in five months after the beginning of the treatment; the third case (Mrs. Lena F.) gained three pounds in the first three weeks, and eight pounds in seven weeks after commencing treatment.

The increase in weight, of course, continues as long as this excessive amount of food is taken. At the same time we find a general increase in bodily strength, so that patients who were invalids for a long time and a burden to their families and themselves could again resume their work and become useful members of society.

Simultaneously with this strengthening of the body the original complaints, usually not due to organic lesions, can be at the same time removed by medical skill. Alimentotherapy, therefore, in these cases is the fundament of complete recovery.

BACTERIOLOGY OF THE BLOOD.[1]

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Experimental studies in many infections, as well as collated bedside and clinical laboratory investigations, have paved the way to give bacteriology, and especially bacteriological inquiry as to the condition of the blood in disease, their proper values as diagnostic aids that the clinician no longer can afford to ignore. This paper is intended to give, briefly, recorded findings that may aid in such diagnosis, to bring together isolated reports bearing upon the mycoses of the blood, and includes a report of illustrative cases. The reported studies, both clinical and experimental, are so indexed that often they are overlooked in a most careful study of the literature, and hence the writer feels free to admit that a number of reports may have escaped his effort, but believes that the most important facts are embraced in the following summary of the literature. That bacteria can gain access to the fœtus through the placenta seems fully established; it is not, however, the purpose of the writer to consider in detail the transplacental infections, but to review only those that seem to establish hæmal infection in the mother as proved by transmission of disease to the fœtus.

Bacteræmia, or bacteria in the blood, is an essential phenomenon in some diseases, as, so far as is known, they do not occur except by

[1] Read before the Pathological Society of Philadelphia, February 12, 1903. Read in part before the Southern Branch of the Philadelphia County Medical Society, November 24, 1902.

microbic invasion of the circulating medium; relapsing fever may be taken as an example of this group. In other diseases it may be an incident of the infection and by no means requisite to the production of the clinical picture or anatomical lesion; with this class belong typhoid and diphtheria among the medical diseases, and abscess and other restricted or localized infections properly belonging to the domain of the surgeon. Among this group blood invasion may be of frequent occurrence, as in typhoid, or rare, as in gonorrhœa; it may or may not rise to the dignity of a complication. In still other morbid processes of an infectious nature the opposite extreme is attained, and at no time is the blood known to be invaded.

The type of bacterial invasion of the blood differs in different cases. It may be a simple infection, such as streptococcæmia, staphylococcæmia, or bacillæmia. There are valid reasons for the belief that initially most blood infections are primarily simple or single, and that when actual invasion has weakened the protective powers, broken down the barriers, it is followed by secondary and tertiary infections. The frequency with which some organisms manifest a tendency to invade the blood has led to the recognition of definite, often complex, processes whose intimate association has been indicated by a single name. The infections due to the pneumococcus may be manifested by purely local phenomena, but in not a few instances multiplicity of lesions establish hæmal distribution, and the condition may quite properly be termed a pneumococcæmia, as this conception best explains the coincidence of otitis, arthritis, meningitis, etc., with or without pneumonia. Boldt[1] suggests the term acute bacteræmia for septicæmia, and chronic bacteræmia for pyæmia.

Technique. Even a cursory review of the literature forces upon one the conclusion that until uniform technique is employed and every step of the process carefully guarded, the results must vary, or, what is much worse, mislead, and thereby throw into discredit a most important adjuvant to accurate diagnosis. The recorded failures in the earlier studies of typhoid, diphtheria, pneumonia, etc., are clearly attributable to deficient knowledge of the essentials that must be borne in mind in each particular experiment. In many instances the failure was due to the use of an inadequate quantity of blood; the infection may be grave and still the peripheral blood poor in viable bacteria. The failure may depend upon too great dilution, or the reverse. For the detection of typhoid bacilli dilution is essential, while the gonococcus may be obtained by blood-smearing the surface of a suitable medium. It is important in every instance so to adjust the technique as to cover the requirements of that particular case. Whatever method is selected

[1] New York Medical Journal, January 26, 1901.

surgical asepsis must accompany every step of the operation. Smears are of little value even when prepared by approved methods. Rarely is it possible by a cover-glass or slide smear accurately to classify the bacteria found, much less to determine the organism observed. The amount of blood included in a smear is too small and the bacteria commonly so few, that careful systematic examination may overlook them; were these objections not insurmountable, the fact that the most important evidence sought is whether living bacteria are present, and to determine this fact the culture alone can be accepted. Even when seeking organisms known not to be cultivatable, the negative evidence yielded by showing that no growths develop renders more trustworthy the findings obtained from spreads. Among the many methods recommended by systematic and current writers the following may be mentioned:

Cabot, after cleansing the flexor bend of the elbow with disinfectants, has an assistant grasp the upper arm in order to prevent the venous return and distend the large veins at the elbow. Into the most prominent of these a sterilized needle, connected with the bulb of a sterilized syringe, is plunged. When the needle penetrates the wall of the vein the blood usually flows into the bulb of the syringe. He then withdraws 1 to 2 c.c. of blood and expels it, before coagulation takes place, into a slant tube of solid blood serum in such a way that it spreads over the whole surface; a small quantity of blood or serum should collect at the bottom of the slant; the tube is then incubated. Macé prefers an iridium needle for obtaining blood for bacteriological study. A. Castellani[1] advises the use of a few cubic centimetres of blood obtained antiseptically and mixed with large quantities of faintly alkaline broth. Three hundred cubic centimetres of broth should be used in each of five or six flasks; the large quantity of culture fluid is necessary to prevent the action of the agglutinins and batericidal bodies that, in the undiluted blood, may lead to untrustworthy results. He advises that the flasks be incubated at 37.5° C. Kuhnau was one of the first to guard against the bactericidal property of the blood in examining for bacteria. In typhoid fever he diluted the blood with 50 c.c. of bouillon from which plates were made.

F. K. White's technique for obtaining and plating the blood differs very slightly from that of other observers. He uses an antitoxin syringe with asbestos packing, and a two-inch needle of rather small calibre; 5 c.c. of blood are withdrawn. He inoculates 0.5 c.c. into tubes of melted agar kept at 42° C. Some of these tubes are slanted, others used for plating. Besides the agar he also uses bouillon. In obtaining the blood after death, a needle three and a half inches long

[1] Centralbl. f. Bakt., etc., 1te Abt. xxxi. (1902), pp. 477–479.

(after cleansing the skin) is thrust through the fourth costal interspace close to the sternum into the right or left ventricle of the heart, 5 c.c. of blood withdrawn and planted in culture media as just described.

Courmont and Lesieur, in cases of enteric fever, use 2 to 4 c.c. of blood in 250 to 300 c.c. of bouillon. Growth may be tardy, however, requiring sometimes five days.

Cole prefers to have the skin over the anterior surface of the arm at the bend of the elbow carefully cleansed with green soap and water, followed by alcohol, ether, bichloride (1:1000), and a hot compress soaked in the latter solution for one-half to one hour before obtaining the blood. Experience shows that the hot compress is of great importance in causing dilatation of the superficial veins. Before abstracting the blood the bichloride is removed by spraying with sterile water. He uses 8 to 10 c.c. of blood and divides this among flasks each containing 150 c.c. of bouillon, so that the dilution is from 1:75 to 1:150. The flasks are shaken thoroughly and placed in the incubator at 37.5° C. If, at the end of twenty-four hours, the bouillon is cloudy it is plated upon agar.

H. Schottmüller examines the blood for typhoid bacilli as follows: After carefully cleansing with ether a rubber bandage is rolled around the arm and about 20 c.c. of blood removed from the vein at the elbow, using a sterile Luer syringe. The blood is next passed into several tubes of liquefied agar kept at 45° C., so that to every 6 c.c. of the medium 2 to 3 c.c. of blood are added. This, after thoroughly mixing, is plated and kept at 37° C. His diagnosis in typhoid is simplified as follows: If on examination of the plates the colonies contain motile bacilli the diagnosis is positive without further examination. As a rule, no other germs of this character were found, although occasionally pseudodiphtheria bacilli were encountered, as well as staphylococci. These, he believes, are contaminations from the skin.

Auerbach and Unger use 300 c.c. of bouillon and 20 to 30 drops of blood. The blood is withdrawn from the median vein with a sterile syringe under strict aseptic precautions. After appearance of a growth in this medium, inoculations should be made upon agar, into milk and sugar bouillon. In enteric fever they further tested an eight-hour bouillon culture with a strong agglutinating serum. By this method they could establish the presence of typhoid bacilli within thirty-six hours. Unger suggests using a large quantity of blood and diluting with a greater volume of nutrient fluid media, thereby favoring the development of organisms.

H. Skipton Tracy cites the following technique pursued in a number of cases. He recommends washing the arm with soft soap, turpentine, carbolic acid (1:30), and sterilized water, in the order named. Then a bandage is tightly applied on the upper arm to distend the

veins. An exploring syringe, with a capacity of 3 c.c., is inserted into a vein immediately under the skin. The blood is expressed into a tube of sloped agar and into a tube of bouillon and incubated. Spreads made and stained by the usual methods "will disclose the organism."

Symes[1] says that not more than 0.5 c.c. of blood should be added to 10 or 15 c.c. of broth. The preference at the present day is for a liquid culture medium, preferably bouillon.

James and Tuttle[2] have devised an apparatus consisting of a piece of glass tubing 12 cm. in length and 6 mm. in diameter, having a capacity of 2 c.c.; one end is tapered and ground to fit a hypodermic needle (No. 42), the other end is plugged with cotton. A larger tube incloses the one described above; both ends are plugged with cotton, and the whole apparatus sterilized by dry heat. When ready for use the inner tube is removed, the needle introduced into the vein, which is made prominent by pressure, and the blood collected.

After repeated observations clearly establishing the unreliability of superficial preparation, Prof. Coplin has formulated for use in the laboratories of the Jefferson Medical College Hospital the following elaboration and extension of Sittmann's method:

The bend of the elbow and the upper half of the forearm and lower half of the arm are washed with hot water and soap, using a stiff sterile brush; this is followed by sterile water and alcohol (60 per cent.) to remove the soap, and the preliminary disinfection is concluded by applying over the area a sterile gauze wrung out of a hot 1:1000 aqueous solution of corrosive sublimate; after twenty-four hours this dressing is removed, the arm again cleansed with alcohol and ether, followed by hot 1:1000 bichloride, and lastly with sterile hot water or normal salt solution. The use of hot solutions is important, as they not only dilate the vessels, as pointed out by Cole, but stimulate the sweat and sebaceous glands, inducing increased secretion, and thereby flushing out the ducts. The median vein of the arm is made prominent, cut down upon, fully exposed, and the skin drawn to either side out of the field of operation; a sterile hypodermic needle of large calibre or a trocar and canula, or an aspirating needle is introduced and the required quantity of blood allowed to flow into the culture vessels used and into a sterile tube. As much as 20 c.c. of blood should be obtained, certainly less than 5 c.c. must be considered insufficient in any case. Plates should be prepared according to the method advised by Schottmüller and given above. Bouillon in flasks should be inoculated, following the directions given by Cole. Agar, and also serum slants, should be inoculated as recommended by Cabot. Make spreads on cover-glasses or slides and inoculate at once at least 5 c.c., prefer-

[1] British Medical Journal, September 14, 1901.

[2] Med. and Surg. Reports of the Presbyterian Hospital, New York, 1898, vol. iii.

ably more, into a rabbit, or guinea-pig, or both. A sterile test tube containing some of the blood withdrawn should be incubated with the other inoculated media. It will be observed that each step is a control to others; the plates may render it possible to determine the number of viable bacteria per cubic centimetre. The bouillon permits dilution under favorable conditions; the solid media may be adapted to special circumstances—*e. g.*, urine agar or human blood-serum agar for the gonococcus, blood-smeared agar for the bacillus influenzæ, etc. The exigencies of general or hospital practice may demand haste and preclude the confessedly somewhat elaborate preparation and execution advised, but any marked deviation from the method outlined must militate against obtaining trustworthy results.

Spreads made at the time the blood is taken from the vein can be fixed and stained with any of the ordinary aniline dyes, as methylene blue, gentian violet; in fact, any of the usual laboratory dyes, or by special methods selected for the purpose of differentiating bacteria supposed to be present. Gunther's[1] method consists in immersing the spreads in a 5 per cent. aqueous solution of acetic acid for ten seconds until the hæmoglobin has faded, after which the acid is removed by briskly blowing upon the cover. The spread is then held, film downward, over the open mouth of a bottle containing ammonia, which neutralizes any residual acid. The film is then stained with the Ehrlich-Weigert aniline-oil-gentian-violet solution for twenty-four hours, after which it is decolorized with a 1 : 14 solution of nitric acid until the color fades to a light green; then rinse in alcohol, dry in air, and mount in balsam. This method removes the erythrocytes and gives a very clear field for the study of bacteria.

Review of the Literature, with Special Reference to the Modern Application of Systematic Bacteriological Examination as an Aid to Clinical Diagnosis.

Da Costa[2] mentions the following organisms as having been isolated from the circulating blood by different observers: B. anthracis, B. coli communis, B. influenzæ, B. lepræ, B. mallei, B. pestis, B. tetani, B. tuberculosis, B. typhosus, meningococcus, pneumococcus, staphylococci, streptococci, and gonococcus. In rheumatic fever Triboulet found diplococci, and Achalme, bacilli. Afanassiew observed peculiar bacilli in relapsing fever; Craig, diplobacilli in mumps; Class, Baginsky, and others have found diplococci in scarlet fever, and Balfour and Potter, diplococci in typhus fever. The spirillum of relapsing fever was demonstrated in the blood by Obermeier.

[1] Forschr. d. Med., 1885, vol. iii. p. 775. Quoted by Da Costa.
[2] Da Costa. Clinical Hæmatology, 1901, p. 111.

To the foregoing Macé adds the B. pyocyaneus, B. enteritidis, B. proteus vulgaris, B. botulinis, B. pneumonia (Friedländer), B. œdematis maligni, and the micrococcus tetragonus.

As the B. anthracis was observed by Pollender (1849) in freshly drawn blood, it may be mentioned first. Blumer and Young[1] isolated the bacillus anthracis in cultures and found the organism in spreads made from a case of anthrax. D. Morisani[2] records an instance of anthrax in a pregnant woman; the fœtus was stillborn, but no cultures were obtained from its tissues. S. Romano[3] reports the case of a pregnant woman who, while suffering from malignant pustule, gave birth to a healthy child. F. Marchand[4] records a case where, the mother suffering from anthrax, the infant developed the malady. Bacilli were found in the intervillous spaces of the placenta. Infection of the infant may have occurred in the act of birth, but the avenue of maternal infection could not be determined.

M. J. Rostowzew[5] reports three cases of malignant pustule affecting pregnant women at the eighth, seventh, and fourth months, and proving fatal a few days after the expulsion of the uterine contents. The bacillus of anthrax was found in the placental intervillous spaces and in the fœtal villi. In one case there were hemorrhages into the placental substance; in another, areas of coagulation necrosis were observed, from which the bacillus was isolated. Rostowzew found the organisms in the liquor amnii. Some organisms were recognized in the blood, but they stained poorly, being possibly in a more or less inactive stage.

The following observation by two French authorities is a very interesting one as regards tuberculosis, and if the conclusions are to be relied upon, it seems reasonable to suppose that the tubercle bacillus should be present in the circulating blood at some period of the malady. Fournier and Beaume[6] conclude that the tubercle bacillus was present in the urine in all cases of acute tuberculosis that they examined. They urge that finding the organism in the urine possesses diagnostic value. The kidney need not be tuberculous.

The disease must be rapidly progressing, but the lesion may be in the lung or serous membranes (pleura or meninges). Anchi and Chambrelent[7] report a case of tuberculosis in a fœtus delivered between the sixth and seventh months. The mother died three days after confinement, and tubercles were found in the lungs and all the abdominal viscera. Tubercles were also present in the viscera of the fœtus,

[1] Johns Hopkins Hospital Bulletin, 1895, vol. vi. p. 127.
[2] Morgagni, 1886, vol. xxviii. p. 523.
[3] Ibid., 1888, vol. xxx. p. 458.
[4] Arch. f. Path. Anat., 1887, vol. cix. p. 86.
[5] Zeit. f. Geburtsh. u. Gynäk., 1897, vol. xxxvii. p. 542.
[6] La Méd. Mod., December 4, 1902, p. 397.
[7] Arch. de Méd. Exper. et d'Anat. Path., 1899, vol. xi. p. 521.

together with "an enormous quantity of Koch's bacilli." Rabbits inoculated with fragments of the liver and lung of the infant exhibited tubercular manifestations two months later. Two cubic centimetres of blood from the umbilical cord were injected into the peritoneal cavity of another rabbit; this animal died in a year; tubercles were demonstrated in the peritoneum, mesenteric glands, liver, spleen, and lungs, with bacilli in all the lesions.

Jakowski,[1] in 7 of 9 cases of pulmonary phthisis, found streptococci and staphylococci; Hewelke, in 14 out of 27 cases, found staphylococci in 7, while in the remaining 7 unknown or non-pathogenic organisms were observed. Schabad, in 6 of 7 cases, found staphylococci; Petruschky, obtaining blood by wet-cups in 8 cases, found streptococci and staphylococci in only one; Straus obtained purely negative results in 19 cases. Sittmann, in 5 cases, using 2 c.c. of blood for cultures, found staphylococci in one, while the others were practically negative. Kraus obtained staphylococci in but one case out of 14. Hirschloff in 35 cases found bacteria (variety not mentioned) in only 4. Lasker,[2] in a series of 68 cases of the same disease (blood from the vein of the arm), found in one streptococci, in another white staphylococci. In several other cases in which colonies developed the observer attributes them to impurities. He used glycerin-agar as a medium. Barbier and Pollener[3] report a case in a child, aged three years, where no macroscopic or microscopic lesions were observed, yet portions of the lung inoculated into guinea-pigs produced tuberculosis. They conclude that the results obtained could only be accounted for upon the supposition of an intense toxæmia, possibly a bacillæmia, the latter being unattended with the formation of tubercles in any of the tissues. Charrin,[4] before the discovery of the tubercle bacillus, reported a case of fœtal tuberculosis in which the lesions in the mother were principally thoracic, while in the infant (born prematurely at the seventh month) the lesions were principally abdominal.

Our views concerning blood infection in typhoid have been radically changed within the last few years. Practically all text-books on bacteriology accept the older view that the typhoid bacillus rarely invades the circulating blood—a view that has been shown to be incorrect by recent observations and indicated by earlier workers to be fallacious.

P. Ernst[5] was the first to observe the typhoid bacillus in the blood of the living fœtus. The infant lived ninety-three hours, and the organism was found, post-mortem, in the spleen, brain, and marrow of

[1] Journal of Tuberculosis, April, 1901, p. 165.
[2] Deutsche Aerzte-Zeitung, January 15, 1901.
[3] La Tuberculose Infantile, August 15, 1900.
[4] Mém. et Compt. rend. Soc. de Méd. de Lyon, 1873, vol. xiii. pt. 2, p. 65, 1874.
[5] Beiträge zur path. Anat. u. zur allg. Path., 1890, vol. viii. p. 188.

the femur. W. Fordyce[1] found in a five months' fœtus, soon after delivery, from a woman dying of typhoid fever, the typhoid bacillus in the kidney, spleen, and intestinal contents, but not in the blood. V. Frascani[2] made careful examinations of three fœtuses from women suffering with typhoid. In only one he found the typhoid bacillus in the placenta, but not in the fœtal organs. C. J. Eberth[3] was able to demonstrate the presence of the typhoid bacillus in the blood, spleen, and placenta of a stillborn fœtus. T. Janiszewski[4] reports a case of congenital typhoid fever, the patient living fifteen days. In this case, as well as that observed by Freund and Levy,[5] there were no special localizations of pathological processes, but a general blood infection by the typhoid bacillus. Resinelli[6] obtained negative results from cultures made from a fœtus, the mother having typhoid. Hildebrandt[7] also observed the typhoid bacillus in an infant.

Neuhauss[8] reports a case of enteric fever with abortion at the fourth month of pregnancy. From the lungs, spleen, and kidneys of the fœtus, typhoid bacilli were obtained. Horton-Smith[9] isolated the typhoid bacillus from the fœtal heart and spleen in a fœtus four months old. The identity of the organism was established both by cultures and by Widal's reaction. Frascani[10] cultivated the typhoid bacillus from the lungs of an eight months' fœtus born during typhoid fever five weeks after the patient's admission to the hospital. Cultures taken from the spleen of the mother by means of a hypodermic syringe developed the same organism. Balp[11] reports the abortion of a fœtus six months advanced, during the fifth week of typhoid fever. In the spleen and liver of the fœtus the typhoid bacillus and yellow pus cocci were found. Speier[12] isolated the typhoid bacillus from a fœtus which was aborted on the twenty-first day of typhoid fever, in the fourth month of pregnancy.

Bolton[13] was successful in cultivating the typhoid bacillus from the gall-bladder and spleen of a five months' fœtus extruded upon the twenty-ninth day of typhoid. In a child dying nine days after delivery, Blumer[14] was able to isolate the typhoid bacillus from the umbilical cord, lung, bile, and spleen, while inoculations made from the heart, liver, and kidneys remained sterile. From two fœtuses,

[1] Transactions of the Edinburgh Obstetric Society, 1898, vol. xxiii. p. 90.
[2] Rev. gen. Ital. di clin. Med., 1892, vol. iv. pp. 282, 348.
[3] Fortschr. d. Med., 1889, vol. vii. p. 161.
[4] Münch. med. Woch., 1893, vol. xl. p. 705.
[5] Berlin. klin. Woch., 1895, vol. xxxii. p. 509.
[6] Ann. de Ostet. e genec., 1896, vol. xviii. p. 695.
[7] Fortschr. d. Med., 1889, vol. vii. p. 889.
[8] Berlin. klin. Woch., June 14, 1886, No. 23, S. 389.
[9] Lancet, March 31, 1900, p. 911.
[10] Rivista Gen. Ital. di Clin. Med., 1892, No. 4, p. 282.
[11] Gaz. Med. Lombarda, 1891, vol. li. p. 396.
[12] Inaug. Dissert., Breslau, 1897.
[13] Journ. of Path. and Bact., February, 1901, vol vii. p. 137.
[14] Journ. Amer. Med. Assoc., December 29, 1900, p. 1674.

Richardson[1] was able to cultivate the typhoid bacillus. In one he obtained it from the liver, while in the second he was able to isolate the organism from the heart, liver, and kidney. Lynch[2] mentions two cases of typhoid fever occurring in pregnant women who aborted (month not stated). From the fœtus of the first case he was able to cultivate the typhoid bacillus from the liver, heart, and heart's blood, although examination of the mother's blood upon three occasions proved negative. In the second case the child lived seven days in an incubator. The bacillus coli communis was cultivated from the heart's blood and fœtal organs. No typhoid bacilli were demonstrable in the placenta or fœtal vessels.

Hewlett,[3] in 125 cases of enteric fever, isolated the bacillus of Eberth from the blood in 90. Richardson[4] isolated the typhoid bacillus from the rose spots in 13 out of 14 cases of enteric fever. He first disinfected the area, then applied ethyl chloride, made a crucial incision in the spot and inoculated with the blood thus obtained. Quite a number of spots were examined. Lesieur[5] states that he has found the typhoid bacillus in each of 36 patients suffering with typhoid. In 6 the serum reaction was negative; he regards the search for the bacilli of more value than the serum reaction. The technique is less easy and demands from thirty-six to forty-eight hours.

Courmont[6] constantly found in the blood of patients having a severe or moderate form of typhoid fever the bacillus typhosus. It is usually present as early as the fifth day, and persists until the end of the third week. In prolonged cases or relapses it remains longer, but this is not constant. He further states that the presence of the typhoid bacillus in the blood has no relation to the sero-reaction, because this can be positive only later, although the organism exists in the blood from the fifth day. Courmont and Lesieur[7] confirm the conclusions of their earlier work in typhoid fever. Of 37 cases (medium or grave) in adults, they have shown that the bacilli are present in the blood from the first days to the end of the third week. In the discussion which followed the presentation of the papers just mentioned, Widal stated that in five light cases examined between the fifth and twelfth days of the disease, the bacilli could not be demonstrated in the blood. In 20 cases (medium or grave) the bacilli were found in 17 some time between the fifth and fifteenth days. In 11 out of 15 cases of enteric fever, Cole[8]

[1] Journ. Boston Soc. Med. Sci., December 4, 1900, vol. v., No. 4, p. 116.
[2] Johns Hopkins Hospital Reports, 1902, vol. x., Nos. 3, 4, 5.
[3] Medical Record, November 30, 1901. [4] Philadelphia Medical Journal, March 3, 1900.
[5] Soc. Med. des Hôpitaux de Lyon, Seance, November 7, 1902; also Gaz. Hebd. de Med. et Chir., November 27, 1902, p. 1128.
[6] Semaine Med., 1902, No. 1.
[7] Soc. Med. des Hôpitaux, December 5, 1902; also La Med. Mod., December 10, 1902, p. 407.
[8] Johns Hopkins Hospital Bulletin, 1901, vol. xii. p. 208.

was able to identify the typhoid bacillus not only by the appearance of plate colonies, but by subcultures on different media, and finally agglutination by known typhoid serum in dilution of 1 : 50 in one hour. The positive results were obtained at various stages of the disease, mostly during the second week; earliest on the sixth day and latest on the twenty-seventh day, the latter being on the second day of an intercurrent relapse. In five cases the cultures were positive before a satisfactory Widal reaction was obtained. F. G. Harris and E. K. Kerr[1] report finding the typhoid bacillus in the blood in 31 of 56 cases. All observers agree that the cultures are positive before the Widal reaction is obtained.

Warfield[2] reports a case of typhoid fever in a child, aged twelve years, having had three relapses. From the blood a pure culture of the typhoid bacillus was obtained. In two cases of enteric fever, Stacey[3] obtained the typhoid bacillus from the blood in both. In three series of cases Schottmüller[4] was able to diagnose enteric fever by examination of the blood before the clinical diagnosis had been made. As early as the second to the fifth day motile bacilli were observed in plates made by the procedure recommended by him. In the first series of 50 cases observed in 1899, he isolated the bacillus in 40 cases (80 per cent.); in the second series of 61 cases in 1900, the organism was found in 58 cases (84 per cent.); and in 1901 and 1902 in 101 cases he obtained positive results in 84 per cent. He considers it proper to regard each case of typhoid as a specific bacteræmia, and that it is probable the bacilli reach the blood through the inflamed mesenteric glands. As regards the number of colonies per 100 c.c. of blood examined he has found from 5 to 2020. In cases where remittance or recrudescence of the fever had taken place no bacteria were found in the circulation. Auerbach and Unger,[5] in 10 cases of typhoid fever, observed the bacillus typhosus in 7. In their seven positive cases they found the bacillus typhosus in

3 cases	upon the	. . . . .	12th day.
1 case	" "	. . . . .	16th "
1 "	" "	. . . . .	22d "
1 "	" "	. . . . .	29th "
1 "	" "	. . . . .	42d "

Schottmüller,[6] from a case which in some respects clinically resembled typhoid fever, withdrew 20 c.c. of blood, mixed it in six tubes of liquefied agar and plated. In forty-eight hours thirty-four colonies were visible, mostly situated in the depth of the medium; they were

[1] Paper read before the Chicago Pathological Society, October 1, 1902.
[2] Johns Hopkins Hospital Bulletin, July, 1902.
[3] Australasian Med. Gazette, October 20, 1902, vol. xxi., No. 10.
[4] Münch. med. Woch., September 23, 1902.
[5] Deut. med. Woch., December 6, 1900.
[6] Ibid., August 9, 1900.

of a blackish-green color, while the few upon the surface were of a mouse-gray color. He states that these peculiar colors of the superficial and deep colonies are characteristic of typhoid and typhoid resembling bacteria in blood cultures, and apparently due to the change of the blood-coloring matter by the growing bacteria. The colonies contained rods which in hanging-drops showed the form and motility of the typhoid bacillus. They decolorized by Gram's method. Culturally the organism resembled the typhoid bacillus, with the exception that it fermented sugar bouillon. It was also negative to Widal's test in dilutions of 1 : 100, 1 : 50, and 1 : 20 with serum from a typhoid patient, but agglutinated perfectly with the patient's serum in dilution of 1 : 50 and 1 : 20. After subsidence of the fever the serum reaction was again tried in dilution of 1 : 100 ; it gave a clearly defined agglutination with the bacillus. He concludes from the examination of this case that the infection was due to a bacillus closely resembling the typhoid and the colon group of organisms, and that there are cases which clinically are like typhus abdominalis, but not due to the typhoid bacillus. Gwyn[1] isolated from the blood a paracolon bacillus in a case which closely resembled the one observed by Schottmüller. Johnston,[2] Longcope,[3] Coleman and Buxton,[4] and Cushing[5] have also isolated typhoid-like bacilli from the blood in cases clinically resembling typhoid fever. The most conspicuous difference in the organism isolated in all these cases is its non-agglutination with typhoid serum. Hewlett,[6] in a case similar to that of Gwyn, isolated from the blood a bacillus which agglutinated with the patient's serum in dilutions of 1 : 100, and did not agglutinate with typhoid serum.

Canon[7] states that it is now a routine practice at the Moabit Hospital at Berlin to draw 2 to 5 c.c. of blood from the median vein and sow it on agar or bouillon, or to inoculate animals in every case of blood poisoning, progressive phlegmon, or general sepsis. This examination is made as early as possible and the number of colonies that develop is recorded. He has been impressed with the fact that the finding of staphylococci is less important than when streptococci are encountered, especially when the staphylococcus infection is an osteomyelitis.

Kohn,[8] in a case of sepsis following osteomyelitis, and using 10 c.c. of blood inoculated into serum-glucose-agar and glucose bouillon obtained entirely negative results. In a second examination 15 c.c.

[1] Johns Hopkins Hospital Bulletin, 1898, vol. ix. p. 54.
[2] The American Journal of the Medical Sciences, August, 1902.
[3] Ibid., August, 1902.
[4] Ibid., June, 1902.
[5] Johns Hopkins Hospital Bulletin, 1900, vol. xi. p. 156.
[6] The American Journal of the Medical Sciences, August, 1902, p. 206.
[7] Mittellungen a. d. Grenzgebieten (Jena), vol. x. pp. 3–4.
[8] Medical Record, January 17, 1903.

of blood were used, and in glucose bouillon the staphylococcus pyogenes aureus was obtained.

Von Eiselberg[1] shows that the blood in cases of sepsis does not contain as many bacteria during life as immediately after death, when cultures are made directly from the heart. Of 156 cases of sepsis examined, in 77 the specific organism was found in the blood during life; in 70 cases only after death could the organisms be found in the heart's blood, while in the remaining nine cases no bacteria were found during life or at post-mortem. The organisms encountered were the streptococcus, staphylococcus, pneumococcus, gonococcus, and bacillus coli communis. In three cases of puerperal septicæmia, Stacey isolated the streptococcus pyogenes in one, and the staphylococcus albus (? streptococci) in the other two. In cases of sepsis Bonnaire[2] mentions three instances in which streptococci seem to have passed from the mother to the fœtus by the placental route. In sepsis neonatorum the streptococcus, staphylococcus, bacillus coli communis, bacillus enteriditis of Gärtner, and a bacillus analogous to the bacillus of Friedländer, have been isolated by different investigators. Barrows,[3] in a case of puerperal septicæmia, isolated the streptococcus pyogenes from the circulating blood. F. K. White,[4] in 18 cases of sepsis, chiefly of local septic infection without the formation of metastatic abscesses, found in 37 blood cultures made during life specific bacteria only four times. The streptococcus pyogenes was found in pure culture three times, and the staphylococcus pyogenes aureus in pure culture once. Fifty to sixty colonies of streptococci were obtained from 1 c.c. of blood.

C. Bidone[5] mentions an instance of a pregnant woman attacked by facial erysipelas, who gave birth to a child at full term. She died in the puerperium from septic peritonitis and endometritis. The infant died nineteen hours after birth, and at autopsy vegetations were found on both tricuspid and mitral valves, but especially on the former. Numerous streptococci were found in the spleen, lungs, and kidneys, but more particularly in the vegetations on the cardiac valves. Cultures and inoculations showed that the micro-organism was the streptococcus of erysipelas.

Achalme[6] found that streptococci were present in great numbers in the connective tissue separating the lobules of fat in the subcutaneous structures and in the walls of the lymphatics in cases of erysipelas neonatorum. G. Ricker[7] reports two cases in which the streptococcus pyogenes was found in the fœtus. In one case the mother died from diphtheria, and the streptococcus was found in her body, in the pla-

[1] Wiener klin. Woch., 1890.
[2] L'Obstetrique, 1899, vol. iv. p. 473.
[3] New York Medical Journal, January 31, 1903.
[4] Journ. Exp. Med., May and July, 1899, Nos. 3-4, vol. ix. p. 425.
[5] Teratologia, 1894, vol. i. p. 182.
[6] Thèse de Paris, 1892.
[7] Centralbl. f. allg. Path. u. path. Anat., 1895, vol. vi. p. 49.

centa, and in the liver of the fœtus. In the second, the mother suffered from an abscess of the arm, which proved fatal after the delivery of a stillborn infant, which showed the streptococcus in the blood of the umbilical vein.

Da Costa claims that in erysipelas bacteriological examination of the blood is usually negative. Pfahler[1] has isolated a diplococcus quite constantly from the blood of the area involved in cases of this disease. Ballantine says that streptococci apparently sometimes pass the placental barrier and invade the fœtal tissues by the umbilical avenue of entrance. They must, then, reach first the organs, such as the liver and heart; and there is evidence to show that they may set up morbid changes in these parts without affecting the skin or subcutaneous tissue at all. This latter is true of variola, in that not having the pustules of the disease externally there may have been secondary infection by staphylococci and streptococci.[2]

In croupous pneumonia the pneumococcus is frequently found in the circulating blood. In numerous cases of pneumococcic arthritis various observers seem to have established fully that the organism reaches the joints by way of the blood. Prochaska[3] concludes from his study that in all cases of pneumonia a careful examination would demonstrate the presence of bacteræmia, and mentions in another report[4] that he isolated the diplococcus of pneumonia from the blood in four cases of pneumococcus sepsis. Cole[5] believes that in severe cases the pneumococci are either more numerous or more resistant, and does not agree with Prochaska, that the number of pneumococci in the blood has no relation to the severity of the attack. G. Carbonelli[6] records a case of pneumonia in a fœtus which showed diplococci in the blood, spleen, and peritoneal exudation, while the mother had suffered from no infectious disease during her pregnancy. Netter records a case of pneumonia where pneumococci passed from the mother to the fœtus. Stacey, in 17 cases of croupous pneumonia found the pneumococcus in the blood in 7 cases, and in only 3 of these before death. Silvestrini and Sertoli[7] found the diplococcus of pneumonia in the blood in 15 of 16 cases examined. Beco reports one case of pneumonia due to Friedländer's bacillus in which there was a general bacillæmia. Baudel claims that in pneumonia the number of organisms (diplococci) bears a relation to the gravity of the local process. He further claims that the diplococcus may localize itself in the blood primarily or secondarily, and that the persistence of the organism in the blood is a common phenomenon and

[1] Philadelphia Medical Journal, April 19, 1902.
[2] Anche. Bull. Soc. d'Anat. et Physiol. de Bordeaux, 1892, vol. xiii. p. 278.
[3] Deut. Arch. f. klin. Med., Band lxx., Heft 5 and 6.
[4] Deut. med. Woch., May 22, 1902. [5] Johns Hopkins Hospital Bulletin, June, 1902.
[6] Riv. di Ostet. e genec., 1891, vol. ii. p. 281.
[7] Nothnagel's Practice, Diseases of Bronchi, Lungs, and Pleura, pp. 417, 418.

not a complication to be dreaded. E. Phillipi[1] reports a fatal case of lobar pneumonia in which Friedländer's bacillus was cultivated from the blood during life and was obtained from the pulmonary lesions at autopsy. The pneumococcus was not obtained from the pulmonary lesions.

F. K. White, in 19 cases of lobar pneumonia, all at least moderately severe, obtained the diplococcus of pneumonia only three times during life in fatal cases. In 8 negative cases which were autopsied pneumococci were found in the lung, but there was no evidence of a general infection. No organism save the pneumococcus was found in the blood in any case. Only ten to sixty colonies were observed per cubic centimetre.

In influenza Canon[2] found a number of short bacilli in the blood of twenty cases; while Pfeiffer and Ruhnau[3] obtained negative results Jehle[4] obtained cultures of the bacillus of influenza in cases of diphtheria, pertussis, scarlet fever, measles, and varicella. He believes that these diseases predispose to an influenzal bacteræmia.

Hunter and Nuttall,[5] in discussing the bacteriology of cerebro-spinal meningitis, state that Gaucher, in 1881, demonstrated the presence of micrococci in the blood. Salomon[6] does not accept the positive view of Marx, that meningitis due to the meningococcus is always a blood infection by way of the tonsils, but reports an instance in which the coccus was obtained from the blood and cerebro-spinal fluid during life. Jager has found the organism in the spleen, kidneys, and pericardium. In Salomon's case the coccus was present in the blood some time before it was localized in the meninges, hence the meningitis was predicted and confidently awaited. Stacey obtained negative results in one case of epidemic cerebro-spinal meningitis.

Gwyn[7] reported a case of epidemic cerebro-spinal meningitis from which he isolated the diplococcus intracellularis during life from the blood as well as from fluid obtained by spinal puncture and from fluid aspirated from an inflamed joint. In 8 cases of cerebro-spinal meningitis, 6 of which were fatal, F. K. White found no pathogenic bacteria in blood cultures. In 5 cases blood cultures were made shortly after death, and all proved sterile. Gradwohl[8] details a very interesting account of a mother affected with epidemic cerebro-spinal meningitis transmitting the disease to a seven months' fœtus which, owing to the death of the mother, remained undelivered. Bacteriological examination of fluid from both the maternal and fœtal meninges revealed the

[1] Münch. med. Woch., November 11, 1902; Medical Record, Dec. 6, 1902. p. 909.
[2] Coles. The Blood, 1902, 2d ed. p. 246.
[3] Deut. med. Woch., 1893, vol. xix. p. 816.
[4] Zeit. f. Heilk., 1901, vol. xxii. p. 190.
[5] Lancet, June 1, 1901.
[6] Berlin. klin. Woch., November 10, 1902.
[7] Johns Hopkins Hospital Bull., 1899, vol. x. p. 112.
[8] Philadelphia Monthly Medical Journal, July and September, 1899, vol. i.

meningococcus, which was also isolated in pure culture from the left ear of the mother. In a sporadic case of epidemic cerebro-spinal meningitis in a pregnant woman, Herwerden[1] isolated the pneumococcus from the meninges of both mother and fœtus.

Mary Hamilton-Williams[2] relates cases occurring among East African coolies in which the diplococcus intracellularis was found eighty times in both sweat and blood. In two cases of epidemic cerebro-spinal meningitis in pregnancy studied by P. Foa and G. Bordoni-Uffreduzzi,[3] the mothers suffered from pneumonia, stage of red hepatization. The fœtuses expelled at the fourth and sixth months, respectively, showed in their blood and in the liver the diplococcus of pneumonia.

Letzerich[4] isolated from the blood in three cases of purpura hemorrhagica a bacillus resembling the anthrax bacillus. Inoculation into animals was followed by the same hemorrhagic condition noticed in the human being. This observer himself suffered with the malady, and from his own blood was able to cultivate the same bacillus and produce the same lesions in the lower animals.

Ehrlich[5] mentions that in a case of purpura he was able to obtain the staphylococcus pyogenes aureus from the blood. Hryntschalk[6] was unable to find bacteria in the blood of these cases. Schram and Rubovits,[7] though unable to demonstrate bacteria in the blood in a case of purpura hemorrhagica during life, nevertheless observed numerous micrococci in the walls of the bloodvessels in the tissues examined. In purpura transmitted from mother to fœtus, Diehl[8] could not demonstrate the presence of micro-organisms in the organs of the mother or child, though a very careful examination was made. V. Hanot and Ch. Luzet[9] report a similar case, although they found the streptococcus pyogenes in the petechiæ on the pericardium and liver.

Stacey, in 3 cases of acute infective periostitis and osteomyelitis, found the staphylococcus aureus in pure culture in the blood and in the pus of all the abscesses. In 6 cases of cellulitis organisms were found in the blood in every case. In 3, staphylococcus aureus, in 1 streptococcus, in 1 staphylococcus albus (? streptococcus), and in 1 the staphylococcus aureus during life, but after death the staphylococcus albus and a streptococcus.

Cole[10] mentions a case of infection by the bacillus aërogenes capsulatus

[1] Schmidt's Jahrbuch., 1893, vol. iv. p. 227.
[2] Journal of Trop. Med. Quoted by J. Rutter Williamson, A Clinical Study of Epidemic Cerebro-spinal Meningitis, Calcutta, 1901. The original reference could not be verified.
[3] Deut. med. Woch., 1886, vol. xii. p. 249.
[4] Untersuchungen über die Kinntniss der purpura hemorrhagica. Leipzig, 1883.
[5] Charité Annalen, 1884.
[6] Archiv f. Kinderheilkunde, 1884.
[7] Philadelphia Medical Journal, August 16, 1902.
[8] Zeitschr. f. Geburtsh. u. Gynäk., vol. xli. p. 218.
[9] Arch. de Med. Exper. et d'Anat. Path., 1890, 1s. vol. ii. p. 772.
[10] Johns Hopkins Hospital Bulletin, October, 1902.

in which the organism was demonstrable in the blood during life. About 8 c.c. of blood were withdrawn, 1 c.c. of which was introduced into the ear of a rabbit. The remainder of the blood was placed in twelve tubes of litmus milk. The rabbit was killed after a few minutes had elapsed and placed in the incubator. Twenty-four hours later the rabbit was found to be distended with gas, and crepitus could be made out over the abdomen. Cover-slips made from the liver, spleen, and heart's blood showed the presence of an organism morphologically identical with the bacillus described by Welch and Nuttall. The cultures in milk were also typical of the organism, showing acidification, with coagulation and gas bubbles upon the upper surface of the clot.

Gwyn[1] also isolated the bacillus aërogenes capsulatus during life in a case of chorea insaniens and acute endocarditis. He was able on three occasions to demonstrate this organism in the circulating blood both by cover-slip and by culture, the first time thirteen days before death.

Blum,[2] in a case of malignant endocarditis, isolated the bacillus pyocyaneus from the blood before death and one from the heart's blood one and one-half hours post-mortem.

Harris and Johnston[3] cite a case of gonorrhœal endocarditis from which the gonococcus was isolated. Twelve cubic centimetres of blood were divided among four Erlenmeyer flasks, each containing 150 c.c. of bouillon, to which 20 to 30 c.c. of hydrocele fluid had been added. On two other occasions 12 c.c. of blood were mixed with 25 c.c. of melted agar and immediately plated. In each instance the media remained sterile. Twenty-four hours before death the median basilic vein was exposed under cocaine anæsthesia and 12.5 c c. of blood removed and divided among three tubes, each containing 10 c.c. of melted agar, which was plated, and two slanted hydrocele-agar tubes in which there was an excess of hydrocele fluid. A second 12.5 c.c. of blood was divided among three 150 c.c. flasks of bouillon and one 150 c.c. of litmus milk. Both aërobic and anaërobic methods of cultivation were employed. In the anaërobic cultivations only one colony made its appearance up to seventy-two hours in an agar plate.

In the aërobic cultivations growths were evident in plates of agar and those of hydrocele fluid agar. The flasks containing bouillon remained sterile. Spreads made at random from colonies upon all the media showed in every instance a diplococcus never definitely biscuit-shaped, often lance-shaped, and frequently irregular in size and form. They were decolorized by Gram's method. A marked viscidity was characteristic of all the colonies. Of fourteen plain agar tubes inocu-

[1] Johns Hopkins Hospital Bulletin, 1900, vol. xi. p. 185.
[2] American Medicine, January 17, 1903.
[3] Johns Hopkins Hosp. Bull., October, 1902.

lated, a few minute colonies developed upon two. On a mixture of human blood and agar they grew luxuriantly, some of the colonies reaching 2 mm. in diameter. It could not, however, be cultivated beyond the second generation. No inoculation experiments were made. At autopsy gonococci were obtained from the heart's blood; streptococcus pyogenes from the kidney, urinary bladder, and urethra; bacillus coli communis from the heart's blood, kidney, and urinary bladder.

The above-mentioned observers give the following references to cases of gonorrhœal endocarditis and the results obtained culturally:

Thayer and Blumer[1] isolated the gonococcus from the blood upon a mixture of blood (one-third) and melted agar (two-thirds). Thayer and Lazear[2] obtained the organism upon melted agar; Byelogowy[3] was also successful in cultivating the gonococcus from the blood upon glycerin-hydrocele-agar; and R. J. Wilson[4] was able to isolate the gonococcus in two cases, one upon glucose agar and plain agar, and the other upon plain agar. The amount of blood used varied from 1 to 5.5 c.c.

Unger[5] reports a case of gonorrhœal arthritis which was at first supposed to be a case of osteomyelitis. A growth of gonococci was obtained from blood withdrawn from the median vein and inoculated upon ascitic fluid.

Bacialli[6] reports a very interesting case of acute polymyositis occurring in a man, aged thirty-nine years, in which the staphylococcus pyogenes albus was observed microscopically in the blood obtained from an incision made in removing a piece of muscle from the left leg.

In bubonic plague the bacillus is readily observed in spreads made from blood as well as obtained in cultures. Atkinson[7] records that the bacillus pestis was found in the blood in 221 out of 273 cases. He recommends the use of a medium consisting of bouillon with 2 per cent. peptone and 1 per cent. gelatin.

Novy[8] claims that the number of bacilli in the blood during life in cases of bubonic plague is very small, and for this reason their detection by direct microscopic examination is difficult. In the experience of the German Commission, where the cover-glass preparations gave negative results, the cultural methods were successful. Of 124 cases thus examined 81 gave negative results. Novy recommends the use of 1 or 2 c.c. of blood drawn from a vein and spread over agar tubes or over agar plates. In cultures made from the blood Stacey,

[1] Johns Hopkins Hospital Bulletin, 1896, vol. vii. p. 57.
[2] Journ. of Exper. Med., vol. iv. p. 81.
[3] Bolnitch. Gaz., 1899, No. 4, p. 137.
[4] Bull. Med. Sci., July, 1901.
[5] Corres. Med. Presse, December 11, 1901.
[6] Il Policlinico, 1902, No. 13, fasc. 1 and 2, p. 16.
[7] Lancet, January 26, 1901.
[8] The American Journal of the Medical Sciences, October, 1901, p. 417.

" in a dozen or more " cases of bubonic plague, claims that the bacillus pestis was found in several."

W. J. Calvert,[1] in reporting 36 cases of bubonic plague, demonstrated the organism in the circulating blood obtained from the lobe of the ear in every case. In a few instances the first examination was negative, but the second was positive. In all cases smears and cultures were obtained at intervals of four hours after admission to the hospital. Smears were stained by Gram's method, then counterstained lightly with methylene blue or carbol-fuchsin, which showed to advantage the bipolar staining of the bacillus.

Within quite recent years the bacillus of diphtheria in extremely malignant cases has been isolated from the blood by several observers. Suessewein[2] mentions that diphtheria bacilli are frequently found in the blood in this disease. In a young man, aged nineteen years, suffering with diphtheria, Niessen[3] isolated the diphtheria bacillus in pure culture from blood taken from the median vein. In one case Stacey failed to find the bacillus in the blood.

In 40 children, varying in age from a few days to four years, all believed to be suffering from infections which bade fair to end fatally, Delestre[4] found bacteria in the blood of 14 during life. Of 8 who recovered, but one gave a positive result. The organisms found were the streptococcus, staphylococcus, pneumococcus, and colon bacillus, while influenza bacilli were isolated more rarely. He also showed that premature babies seem especially susceptible to the streptococcus and colon bacillus, while nursing infants several months old are more prone to staphylococcus infections.

Weber[5] isolated blastomycetes during life from the blood of a child, aged two years, suffering from furunculosis. The furuncles were attended with fever; the child finally died from exhaustion. At autopsy tuberculosis of the cerebellum, lungs, and liver was observed.

Lille and Jullien[6] claim to have isolated a bacillus from the blood of syphilitic patients. It is a short, thread-like polymorphic organism, and causes when inoculated into guinea-pigs an indurated ulcer and enlargement of the nearest lymphatic glands.

In a case of congenital elephantiasis[7] in a child, five months old, the streptococcus of Fehleisen was isolated from the blood serum obtained from the lower third of the right leg. Examination of the mother's blood was negative.

Maragliano[8] states that in cases of carcinoma bacteria are rarely

[1] Centralbl. f. Bakt. Parasit. und Infectionskrankheiten, January 26, 1903, No. 4, Bd. xxxiii.
[2] Wien. klin. Woch., February 6, 1902.
[3] Wien. med. Woch., 1902, Nos. 47 and 48.
[4] Annal. de Gynecol. et d'Obstet., 1901, vol. iv. p. 51.
[5] Soc. of Int. Med., Berlin, December 1, 1902; Gaz. Hebd. de Med. et de Chir., December 18, 1902, p. 1200.
[6] Bull. de l'Acad. de Med. de Paris, July 2, 1901.
[7] Trans. Edinburgh Obst. Soc., 1896, vol. xxi. p. 25.
[8] Gazz. degli Osped., January 13, 1901.

found in the blood prior to ulceration of the cancer. He believes that the mycosis of the blood is largely responsible for the cachexia of the condition, even when the bacteria are not endowed with the property of producing suppuration, but of such a low order of virulence as to interfere with nutrition only.

In melæna neonatorum numerous organisms have been isolated by different observers. Gärtner[1] has isolated a bacillus; others have found streptococcus alone or with the diplococcus of pneumonia; bacillus pyocyaneus alone or with the staphylococcus, bacillus lactis aërogenes, a bacillus like that of Friedländer, and a micro-organism suggesting, but not to be identified with, the diplococcus of pneumonia.

Of 37 cases of severe chronic diseases reported by White, including 11 of cardiac disease, 9 of cancer, 4 sarcoma, 3 phthisis, 3 chronic nephritis, 1 each of Pott's disease, arterio-sclerosis, tuberculous meningitis, tuberculous peritonitis, gastric ulcer, chronic rheumatism, and pernicious anæmia, only 9 gave positive results by blood culture.

In two cases of chronic nephritis (parenchymatous) thirty to fifty colonies of the streptococcus pyogenes per cubic centimetre were obtained during life in one, and seventy to ninety colonies of the same organism in the other. In the case of Pott's disease ten to fifteen colonies of the streptococcus pyogenes per cubic centimetre were found. In the case of gastric ulcer six to ten colonies of the staphylococcus pyogenes aureus were obtained. From a case of myocarditis and pericarditis five to eight colonies of the staphylococcus pyogenes aureus per cubic centimetre were isolated. Five to six colonies of the staphylococcus pyogenes aureus were obtained half an hour after death in a case of mitral and aortic stenosis, though during life blood cultures were negative; in a similar case, one-half hour after death, ten to twelve colonies of the staphylococcus pyogenes aureus were found, though three days before death cultures made from the blood were negative.

Blood cultures made two days before death in a case of cancer of the epiglottis were negative, though three-quarters of an hour after death ten to twenty colonies of the streptococcus pyogenes per cubic centimetre were found.

Original Cases. The accompanying table comprises ten cases which came under the observation of the writer. He wishes, in this connection, to thank Drs. Keen, Da Costa, J. C. Wilson, and Thornton for the privilege of reporting the cases. In the technique (except Nos. 4 and 7) Coplin's modification of Sittman's method was observed, the vein of the arm made prominent and then punctured with a sterile trocar and canula. The trocar being removed, five drops of blood were thoroughly mixed with 20 c.c. of agar and several plates spread.

[1] Arch. f. Gynäk., 1893, vol. lxv. p. 272.

These were incubated, and as soon as colonies appeared they were examined at once. In Case No. 7, 1 c.c. of blood was thoroughly mixed with 50 c.c. of bouillon; the withdrawal of blood was made hurriedly, and only inadequate antiseptic precautions were observed—that is, instead of preparing the arm several hours before puncture of the vein, the arm was simply washed with bichloride solution, 1 : 1000, then with distilled water, and the puncture made immediately afterward. Too much stress cannot be laid upon the question of disinfecting the skin over and around the site of operation; the least laxity in this procedure will readily permit the entrance of omnipresent bacteria.

No.	Name, sex, age.	History.	Clinical diagnosis.	Result of bacteriological examination of blood.	Clinical result.
1	L. T. female, 39	Tumor in left breast, followed by two other masses in the same organ; breaking down of the first nodule, with discharge of straw-colored fluid. Excision of breast; operative recovery; sudden rise of temperature to 101.4° F. 19th day after operation.	Scirrhus of mamma; post-operative infection.	Staphylococcus pyogenes albus.	Recovery.
2	M. O'B. female, 42	History of recurrent carcinoma of breast. Irregular temperature, suggesting sepsis, beginning on day following operation, continuing twenty-seven days; blood examination on 12th day.	Recurrent scirrhus of mamma; post-operative infection.	Staphylococcus pyogenes albus and sarcina lutea.	Recovery.
3	M. Y. female, 47	For nine years has had enlargement of veins of left leg. At time of admission to hospital patient could not walk on account of pain and œdema of part. Temperature 98.2° F. Examination of blood two days before operation of ligating the veins.	Thrombophlebitis of varicose saphenous vein.	Sterile.	Recovery.
4	Mrs. N. female, 36	Three days after labor seized with headache and chills; offensive discharge from vagina. Temperature 98° to 104° F. Blood examined on the 30th day.	Puerperal sepsis with femoral thrombophlebitis.	Sterile. Single inoculation, quantity of blood insufficient.	Recovery.
5	L. H. female, 23	Pain in right iliac region. Temperature 99° F. Examination of blood two days after admission to hospital.	Salpingitis.	Sterile.	Recovery.
6	L. H. female, 23	Following an injury there appeared a growth about the size of an egg at the angle of scapula, which steadily enlarged until at time of operation measured 26 by 15 cm. Excision of mass and parts of four ribs; operative recovery, with temperature from 99° to 102.4° F. Blood examined twenty days after operation.	Sarcoma of ribs and pleura; post-operative infection.	Staphylococcus pyogenes albus.	Recovery.
7	R. H. R. male, 32	Attack of appendicitis; operation; eight weeks later complained of diarrhœa with malaise; temperature from 98° to 104.6° F. A faint systolic murmur was heard over the pulmonic area. Blood examined 4th day.	Malignant endocarditis.	Sterile.	Death.
8	M. G. female, 33	Puerperium followed by slight infection and femoral thrombophlebitis. Examination of blood made during the second week of disease.	Puerperal sepsis.	Sterile.	Recovery.
9	J. D. male, 52	Four weeks before admission to hospital had a severe chill, followed by headache, fever, sweating, and weakness. A chill every other day for a week following admission; temperature from 99° to 104.8° F. No hematozoon malariæ. Examination of blood ten days after admission to hospital.	Malignant endocarditis.	Staphylococcus pyogenes albus, sarcina lutea, and an unidentified chromogenic bacillus.	Death.
10	E. I. female, 21	Following acute tonsilitis; temperature from 97.8° to 104.6° F. for two weeks. No hematozoon malariæ. Three Widal tests negative. Blood examination made on 20th day of illness.	?	Sterile.	Recovery.

It will be seen from this small number of cases that bacteria were found in four (40 per cent.); of these one was malignant endocarditis and three were post-operative infections.

SUMMARY. Bacteriological examination of blood obtained from the living, under suitable conditions, may afford information, without which neither accurate diagnosis nor intelligent treatment is possible. This is particularly true of cases in which antitoxic and bacteriolytic sera are indicated.

For trustworthiness careful attention to technique is a prerequisite. When the organism thought to be present is one not readily grown upon ordinary culture media, special media should be utilized. In infection by the gonococcus, Wertheim's medium or fluid from ascites or hydrocele should be used, though Harris and Johnson and others used plain agar and succeeded in isolating the organism.

Post-mortem examination of the blood should not be relied upon to determine the nature of an infection; in many instances the results are misleading and often entirely untrustworthy. It is a well-known fact that in certain diseases organisms are not present in the blood during life, but in the period just preceding death, as shown by Longcope,[1] there is a marked progressive decrease in the bacteriolytic blood complement which permits the blood to become overwhelmed with bacteria, some of which may be harmless saprophytes. Bacteriological examination of the blood post-mortem in diseases in which bacteria are present ante-mortem, by reason of the agonal infection, usually yields only confusing results.

Transplacental infection constitutes an important element in antenatal pathology.

In 535 collated cases of enteric fever the bacillus typhosus was demonstrated to be present in the circulating blood in over 80 per cent. Schottmüller's belief that all cases of enteric fever should be regarded as bacteræmias, seems justifiable. Observers agree that the bacillus may be demonstrated in the blood before a positive Widal reaction is obtainable. It is a well-known fact that in some typhoid patients the blood does not yield the reaction any time in the entire course of the disease. Sometimes the Widal reaction is obtained with laboratory cultures of the organism early and only later with bacilli obtained from the blood of the patient. Troussaint[2] records seven cases of typhoid (four fatal) in which the bacillus of Eberth was isolated from the blood when the Widal reaction was still negative. In the four fatal cases it was not obtained at all; in one non-fatal case the Widal reaction was positive on the eighth day, with laboratory cultures of the bacillus of Eberth, but not positive with the bacillus

[1] Journal of Hygiene, January, 1903, No. 1, vol. iii.
[2] La Méd. Mod., February 11, 1903, p. 44.

obtained from the blood until the nineteenth day. Further peculiarities of reaction are illustrated by the instance in which the bacillus isolated from the blood did not agglutinate with the same blood, but was agglutinated by the blood of a rabbit immunized to the bacillus of Eberth. The results of the bacteriological examination of the blood in typhoid fever seem to place this procedure as a diagnostic aid in advance of the serum reaction. In cases of enteric fever in the fœtus, numerous instances of which are herein incorporated, the bacillus typhosus has been found in the blood and internal organs in the majority examined. This fact also seems to prove that the disease is, often if not always, a blood infection.

In over 46 per cent. of 176 cases of sepsis various organisms were isolated from the blood obtained during life. These cases included puerperal sepsis as well as local septic processes, such as phlegmons, and cases in which the clinical diagnosis was septicæmia and pyæmia. Infective periostitis and osteomyelitis may be included with this group.

It seems probable that proper identification of the bacteria present in the blood in septic processes would reconcile discordant views as to the therapeutic efficiency of sera.

Of 58 cases of croupous pneumonia the diplococcus of pneumonia was found in the blood in 53 per cent.; the bacillus of Friedländer has been observed occasionally.

In 69 per cent. of 433 cases of bubonic plague the organism was demonstrated in blood obtained during life.

The bacillus influenzæ, the meningococcus, gonococcus, and bacillus diphtheriæ occur in the blood with no degree of constancy. In a number of cases of ulcerative endocarditis bacteria have been found in the blood during life. The same is true of purpura.

By methods at present available the tubercle bacillus is rarely demonstrable in the blood, although clinical and laboratory investigations indicate that it should be more readily obtained. The bacterial flora of the blood in tuberculosis are usually of secondary import, and indicate a more grave prognosis.

It has been mentioned that two observers (Lille and Jullien) isolated a bacillus from the blood serum of a syphilitic. Joseph and Piorkowski[1] also claim to have isolated bacilli from the semen and from the blood of syphilitics. Should these observations be supported by further studies, bacteriological examination of the blood may be of diagnostic value in syphilis, as already established for those complications in gonorrhœa attributable to hæmal dissemination of the gonococcus.

[1] Deut. med. Woch., 1902, Nos. 50-52.

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SUBLINGUAL GROWTH IN INFANTS.

(PRODUZIONE SOTTOLINGUALE, RIGA'S DISEASE, FEDE'S DISEASE, ETC.)

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In December, 1902, a seven-months-old boy was brought to the Children's Department of the Johns Hopkins Hospital Dispensary on account of a tumor under the tongue. The parents of the baby are of American descent. The family history did not reveal any particular affections of the parents. There was particularly no suspicion of tuberculosis or syphilis. Four other children of the same parents never had anything like the affection which brought the baby to the dispen-

sary. The general health was excellent and always had been, in spite of the fact that it enjoyed a rather liberal diet, after having been fed at the breast for about four months. There was no enlargement of the lymph glands of any region. The tumor underneath the tongue was about 1 to 1.5 cm. in diameter and about 5 mm. thick. It presented the appearance of a disk, was rather hard, and its surface was somewhat rough. The oral sufrace of the tumor was of a pearly-white

color, surrounded by a reddish margin; its centre was lightly depressed and showed some sloughing. The tumor was perfectly separated from the tongue and attached to the frenulum with a broad basis.

At the time the baby was seen the growth had persisted for about four weeks, having started, according to the mother's statement, as a hard, white pimple on the frenulum, at the time when the two median lower incisors made their appearance. These were the only teeth which had broken through. They pointed slightly backward, while their median side was slightly turned inward. Their cutting edge was somewhat ragged. Occasionally the tumor is said to have bled a little; it did so at the time of the second examination, after having been touched the day before with silver nitrate. It was possible to lift the growth a little, so that its removal could be readily accomplished by means of the scissors. The operation was performed about two months ago, and since that time nothing more was heard of the little patient.

The affection I have just described seems to occur most frequently in southern Italy, and the reports concerning it are mostly confined to the Italian literature. Since this case seems to be the first on record in the United States, it may be permissible to give a review of the literature. Several of the Italian authors mention an infection described by Urbino Cardarelli in 1857, under the name of "afta cachettica." Its chief characteristic seemed to have been an ulceration on the frenulum linguæ of infants, causing or inseparably associated with general wasting of the little patients, ultimately leading to the exitus lethalis. The notes given by Cardarelli are, according to Fede,[1] insufficient.

In 1872 Ridola[2] mentions a pathological condition of the mucosa under the tip of the tongue in babies of the first year of life, associated with protracted gastro-intestinal catarrh, anæmia, and weakness. The pathological change he describes as a necrosis resembling in its character a specific diphtheritic process. Its origin is attributed to compression brought about by the two median lower incisors. In 1875 Pandolfi[3] reported five cases of a special neoplasm under the tongue of suckling infants. It is described as a fibrous tumor reaching from the frenulum linguæ to the apex, round, of about 1 cm. diameter and 2 mm. thickness, hard, and of a pearly-white color. The rest of the mouth does not show any changes. General symptoms were associated with this tumor—nutrition was interfered with, the muscles were weak, the development retarded, and the mental faculties impaired. Two of the babies died. In one instance the tumor disappeared within a year and with it the general symptoms. In another case the disease, which had started in the sixth month, lasted until the fourth year. With the disappearance of the tumor the child regained its physical and mental health. Pandolfi thought to have observed a hitherto unknown disease. Independently of Pandolfi, Riga[4] laid down the

outlines of a new malady in 1881, with the following characteristic features: Between the apex and frenulum linguæ or on other parts of the latter there is found what he called a neomembrane of a pearly color. It does not change its appearance and never occurs in other parts of the mouth. It is little or not elevated over the surrounding mucosa, of round shape, very difficult to detach, and if detached there is no (or very little) bleeding. After removing the neomembrane the surface on which it was implanted is bared of its mucosa. However strongly cauterized with silver nitrate, the neomembrane is reproduced after one or two days. It may grow to the size of about 1 cm. in diameter. There is no general or partial glossitis; the regional lymph glands are not enlarged. If suckling is interfered with, it is only on account of the weakness of the baby, whose general state of health is bad and becomes gradually worse. The end is nearly always death. In the first days the disease may perhaps be febrile, but later it is afebrile. Gastro-intestinal disturbances are nearly constantly present; rarely hemorrhages in the skin were observed. The disease occurs in suckling infants a little before or at the beginning of dentition. Riga is not inclined to regard the mechanical irritation produced by the teeth as an etiological factor. The parents are always well, but most of the babies present a status lymphaticus. He regards the disease as infectious, but not contagious, and the local lesion under the frenulum as of internal origin.

The communication of Riga was the starting point of a number of publications on the subject, and some of the authors described the affection under the name of Riga's disease. In the same year as Riga, Chiarello[5] reported several cases. In his conception the first manifestation is an ulceration, which later gives rise to diphtheritic products. The ulceration itself is brought about by mechanical irritation, caused by the movements of the tongue over the lower incisors in the act of suckling. If the ulceration begins before the eruption of the teeth, the sliding of the tongue over the gum, hardened through the underlying incisors, will cause an exfoliation of the epithelium and, subsequently, ulceration. Chiarello saw the disease only after the lower incisors had broken through, and always in the course of suckling. The season in which he saw it reached from summer to winter. The severe symptoms are regarded as a consequence of the ulceration. The disease is not infectious; the prognosis serious, although of his five cases one was cured completely; in one the growth had disappeared, but anæmia, etc., remained. The three other cases were still under observation, but did not show any alarming symptoms.

According to De Marinis,[6] the disease is not rare in his district, in southern Italy. The people there call it "ranocchia" (frog). He accepted this term, only translating it into Greek, "batracosi." It is

described as a small, pearly-white, hard, painless fibroid neoformation under the frenulum linguæ. The neglected babies of the poor population are affected. The babies may apparently be in the best state of health or suffering from other diseases. The affection may cause general symptoms, finally leading to death. The most prominent symptom is a progressive cachexia due to mysterious reasons. Preceding, accompanying, or following the appearance of the batracosi are stomatitis, gingivitis, gastro-enteritis, etc. Anæmic and lymphatic conditions of the parents are regarded as predisposing and some significance is attributed to improper feeding; but external causes, as bad hygiene of the mouth, are more important etiologically than constitutional factors. The disease is a family disease in so far as members of one family are subjected to the same injuries. The prognosis is always serious.

Somma[7] sees in the lesion of the frenulum a pseudomembrane (mucositis fibrinosa frenuli linguæ), which starts as a dirty whitish spot, increases to a certain extent, and then remains stationary, with occasional exfoliations due to the action of the lower incisors. Five of his six patients were suffering from various serious diseases. He seems to think that the lesion of the frenulum is purely local and does not participate in the fatal result on its own account, but that this is due to an accompanying, more important disease, which need not be the same in every case. The babies are subjected to a more or less advanced cachexia and nearly constantly to gastro-intestinal disturbances. The disease is more frequent in summer time, when these latter are prevalent. Neither hereditary influences nor the infectious character of the lesion are regarded as proven. Whether or not the cause is mechanical is left undecided, although the lower incisors were present in all of the cases.

Jannone[8] reported an analysis of seventeen cases in 1884. The local lesion begins with an erosion of the inferior part of the tongue and the frenulum. Soon there develops a small, pearly-white, hard, painless spot, increasing to the size of a two-centesimo piece. It then becomes harder and thicker and can persist in this state for a long time. The tissue underneath the pseudomembrane consists of fibroid nodules. The pseudomembrane is difficult to detach and only in small pieces. When the membrane is removed the nodules bleed a little. He admits an individual and a family predisposition, relying on the history given by one of the mothers, who claimed to have lost three babies with the disease. The influence of the summer months is doubtless. In a cold climate the course of the disease is more rapid, the cure easier accomplished. The mechanical irritation produced by the incisors does not figure among the causes, but an influence of the dentition is recognized inasmuch as it affects the general health. The duration of the disease varies between eight days to twenty-one months,

with alternating improvement and relapse. Any more serious manifestations are due to continuous disturbances of the digestion or to dyscrasic affections, which may occur during the disease. Only babies are affected who are in a precarious state of health; but the lesion of the frenulum, if it is not a direct consequence of another disease, is a complication of not much interest. Gastro-intestinal disturbances are constant companions of the disease; these are due to dentition, bad hygiene, and atmospheric conditions. When once cured Riga's disease may reappear. Of the seventeen cases two died, but their death is attributed to complications and negligence. The prognosis, therefore, seems to be favorable. Of interest are the experiments of the author. He put babies with Riga's disease to the breast of healthy women and healthy babies to the breast of women whose babies were affected with batracosi. Furthermore, he removed pieces of the pseudomembrane and placed them on the frenulum of healthy babies. The negative results of these experiments do not speak in favor of an infectious character of Riga's disease.

None of the authors thus far cited reported the histological examination of the growth nor results of an autopsy. The first who made a histological examination was Fede,[9] in 1890. He describes the lesion as a partial alteration of the mucous membrane of the mouth in the form of an excrescence under the frenulum linguæ of several millimetres' thickness and of about 1 cm. diameter. The surface is even or depressed from the margin toward the centre and sometimes it may be somewhat rough, like cauliflower. The tumor is rather hard and consistent, indolent, of a dirty, grayish-white color, with a pearly lustre. It may undergo necrobiosis and ulceration. Clinically Fede distinguishes three different forms. In the first the baby is perfectly healthy and the sublingual tumor is the only pathological manifestation present. In the second group the tumor is associated with other disturbances; the tumor does not improve as quickly and undergoes ulceration more easily. The third group includes those babies where in the course of a serious malady the baby acquires the "produzione sottolinguale." This is the form which is usually described as a grave disease, of which the tumor is said to be the local expression. But according to Fede, any disturbance which accompanies the sublingual growth is due to perfectly different causes and does not stand in any more intimate relation to the neoplasm. The only influence which he ascribes to these general disturbances he finds in the lessened resistance of the tissues of infants in a cachectic condition. The cause of the formation of the tumor is to be found in the mechanical irritation produced by the movements of the tongue of the suckling over the two median lower incisors, particularly when their edge is irregular, sharp, and ragged, taking into account a possible shortness of the frenulum.

If the tumor appears before the eruption of the incisors, the gum hardened by the underlying teeth takes their place, particularly when suckling is difficult. The course which the tumor follows can be different; improvement can alternate with retrogression until the tumor finally disappears completely. The histological examination of the first two tumors showed hypertrophy and hyperplasia of the epithelium and of the papillary body. Therefore, the neoplasm is called a papilloma. In later contributions Fede[10 11] reports the examination of fifteen of his own cases, one by Concetti, one by Giarrè, one by Nota, and two by Boccardi. The histological findings agree well. Fede describes a secondary change of the tumor, which he attributes to the persistency of the mechanical irritation. The epithelium undergoes necrosis and is then given off, while the still hypertrophic and hyperplastic papillary body is infiltrated with a grand mass of round cells, which are embedded in a network of fibrin. Thus the tumor gains the aspect of a granuloma.

Concetti[10] mentions œdematous infiltration of the lymph spaces and a degeneration of the epithelial cells at various parts of the basal stratum. Here he saw cells with double nucleus and nucleolus resembling the much-discussed coccidial cell inclosures found in carcinoma. The bacteriological examination made by Fede and Concetti did not give noteworthy results. Concetti employed different media and had recourse to animal experiments. Fede reaches the conclusion that the produzione sottolinguale is a purely local lesion of the frenulum linguæ of a uniform character, and does not constitute a peculiar disease. Of particular interest at this point are the two cases of Boccardi, which ended fatally. As a striking clinical illustration, Fede[12] reports the history of an infant, aged ten months, which was in a state of severe malnutrition, etc., at the same time the sublingual tumor was present. The sharp incisors were filed and a mouth-wash of boric acid was used. Under this treatment, lasting four months, the tumor improved greatly, while the general condition of the baby became worse. Ultimately the baby recovered.

In direct opposition to Fede stands Pianese, nephew of U. Cardarelli. His opinion is based on 200 observations, 140 of which were communicated to him by different physicians or by the mothers of the affected babies; 60 cases he observed personally. According to Pianese,[10 11] the form described by Fede differs from that described by Cardarelli, Riga, and himself. His conclusions are that the afta cachettica, or Riga's disease, is an infectious disease which usually occurs in healthy infants of healthy parents toward the third or fourth months of life. The first manifestation is a neoformation on the frenulum linguæ of a pearly-gray color, indolent, of the size of a two-centesimo piece, with an indistinctly defined margin, little elevated over the surrounding

tissue. The neoformation may disappear before death, but the baby is not cured. After a certain time the color of the infant changes to a yellowish hue and the baby emaciates. Liver and spleen are enlarged; the bowels are usually constipated. The disease is afebrile and may last for twenty months. If one baby of a family dies from the disease, as a rule the other babies die of it, too. Sometimes one escapes, but the sons of a mother, who as a baby escaped the disease, get it and die. A baby born of an infected mother and nursed by a healthy person escapes, while a baby born of a healthy mother and nursed by an infected person succumbs. The pathological conditions found in three autopsies were bronchopneumonia; fatty degeneration of the liver and of the cortex of the kidney; amyloid degeneration of the spleen. The neoplasm itself is a granuloma showing round-cell infiltration of the derma and deeper in the connective tissue. In some parts cells of an epithelial character are seen. The stratum Malpighii of the neighborhood is slightly hyperplastic. Cultures were taken from the heart, spleen, kidney, lungs, liver, and medulla of the tibia, as well as of the milk of the mother of one of the babies, who came to autopsy. Different media were used. In all the organs, in the milk, and in the sublingual growth the same micro-organisms were found as in the cultures made from them.

In spite of the apparent importance of the disease as described by Pianese, his observations do not seem to have been published *in extenso*. The most surprising feature is that we are left completely in the dark in relation to the nature and characteristics of the micro-organism found. Animal experiments were apparently not made. Some of his statements are directly contradictory to the results of Jannone's experiments. Cannarsa[10] observed the disease frequently partly in the same district as Pianese. Several times he cut the frenulum of healthy children with the same scissors with which he had previously excised the sublingual tumor. The scissors were not sterilized. He never saw an infection and, moreover, nearly all his cases were of a benign nature.

The majority of the authors do not recognize the difference which Pianese tried to establish between the affections described by Riga and Fede. However, there remains more or less difference of opinion as to the nature of the affection, its cause, its prognosis, and as to the conception of its pathological character. In the discussion following the papers[9 10 11] of Fede, Concetti and Pianese, Taura, Dinami, and Tagliaferri stand for the view that the affection is serious, while Nota, Giarrè, and Boccardi, whose cases died, do not believe in the intimate relation between the local lesion and the fatal disease. Lumbardi agrees with Fede, that the sublingual growth may be due to mechanical irritation, and then it is of benign nature. If it comes on spontaneously he regards it, with Pianese, as a manifestation of a general

disease, not well known, malignant, and hereditary. The only one of the more recent writers who states that the prognosis is unfavorable in most of the cases is Gazzotti.[13] He reports two cases, one of which died—the surrounding conditions having been very unfavorable—while the other was still living at the time of his publication. None of the other writers, whether they regard the sublingual growth as a purely local affection or put it in some connection with the accompanying general disturbances, is inclined to attribute to it a very serious prognosis.

Concerning the nature of the affection, Gaspardi and Santi[14] reached the conclusion that Riga's malady really is an entity, and, moreover, that it is an infectious disease, in which the coincidence of the lesion under the frenulum and of the general symptoms is not purely accidental. They were led to this opinion by the results which they obtained with the injection of diphtheria antitoxin. The sublingual growth of the infant had resisted the treatment of silver nitrate, the suckling had become more difficult, and the surrounding tissue was slightly infiltrated, while the general health of the baby had suffered considerably. After the first injection of a thousand units, the general condition improved, but locally there was no change. Eight days later the dose was repeated, with good general effects, and now the infiltration around the tumor diminished. Fifteen days later only a little of the tumor was left and the rest disappeared completely after some time. The authors do not regard the affection as a specifically diphtheritic, because the diphtheria antitoxin has proved of value in different infections. In the other two cases they report the complete cure was accomplished by an antiseptic mouth-wash and correction of the diet, the time required being about three months.

Audard[15] recognizes clinically two forms. In the first the sublingual growth is the whole malady; in the second it is associated with serious disease, but it always remains the characteristic symptom. The two cases which he reports (one of Broca and one personal observation) belong to the benign type.

Guida[16] accuses an insufficient function of the mother's breast as the cause of the affection. The frenulum is subjected to considerable friction against the alveolar arch during the prolonged and forcible suckling. Thus a simple abrasion is produced which may lead to ulceration or to chronic hypertrophy of the mucosa of the frenulum. The insufficient nutrition of the baby may cause other disturbances, and so it is easy to understand the different syndromes described as diseases by Cardarelli, Riga, etc.

Gianelli and Memmi[17] and Cappuccio[18] came to the conclusion that the growth is the production of an infectious process; but it will be seen that its influence on the general health is not rated very highly. The

mechanism of the infection according to Cappuccio is the following: The stretching forth of the tongue over the lower incisors causes a slight abrasion on the frenulum. In this place, denuded of its epithelium, parasites are deposited, either the usual inhabitants of the mouth or others. Here the parasites may complete their evolution, causing a local reaction, in which the hyperplasia of the connective tissue predominates; the result is a fibroma or papilloma. Or the more virulent parasites penetrate deeper into the tissue, calling forth a more intense reaction, and the result is a granuloma. The sublingual lesion may perhaps occasionally be one of the causes of a general infection; but it is not possible to create the type of a definite infectious disease placing the local lesion and the general infection in relation of cause and effect. The conclusions of Gianelli and Memmi are drawn from a clinical observation of twenty-five cases. In badly fed babies intestinal fermentation and gastro-enteritis set in. Under these conditions the habitual microbes of the buccal cavity may become virulent and start a stomatitis. The stomatitis, which is always of an infectious nature, can bring about a lesion of the sublingual mucosa. While the other lesions disappear without treatment or under the application of an antiseptic mouth-wash, the lesion under the frenulum persists and grows, when to the action of the micro-organisms the mechanical irritation of the lower incisors is added. There is reason to attach much importance to this traumatism; but originally the growth is of an infectious nature. When the bacterial action persists together with mechanical irritation, a granuloma is the result. When the bacterial action is finished, while the mechanical irritation lasts, a papilloma is the product. Of their twenty-five cases, thirteen recovered. They admit that the local lesion can participate in the fatal result in so far as it may interfere with the suckling. But the causes of the atrophy, of the cachexia, of the anæmia, and ultimately of the death, are to be sought elsewhere. So the tumor may disappear, while the baby succumbs to other diseases. The affection does not seem to be contagious. An afflicted baby was fed by a wet-nurse, who gave the breast without precaution to her own baby. This remained perfectly healthy.

The observations of Fedele,[19] Rega,[20] Rossi,[21] Callari,[22] Callari and Phillipson,[23] Olyntho,[24] Israel,[25] Reinbach,[26] Comby,[27] and Brun[28] support the view of Fede and Concetti, that the sublingual affection does not stand in any closer relation to the general disturbances, if, indeed, such are present at all. Some of these authors agree, furthermore, with Fede, that the cause is a mechanical one. Fede, Concetti, Israel, Callari, Callari and Phillipson, Reinbach regard the lesion primarily as a tumor, while the inflammatory changes are secondary. On the other side, Brun, Comby, and Audard regard the tumor as a product of inflammatory processes. Comby describes the lesion under the

name of "subglossite diphtheroide," and sees in it a stomatitis limited to the frenulum and of traumatic origin. The degree of traumatism determines whether the result is an ulceration or an hyperplasia of the mucosa.

The interesting data of the descriptions given by Callari and Phillipson, Reinbach and Brun should be reviewed in short. According to Callari and Phillipson, the mass of the tumor consists of connective tissue, which is the direct continuation of the connective tissue of the surrounding mucosa. This mass is not rich in cells. The epithelial layer on the basis of the tumor is thinner than that of the adjoining mucosa, but toward the apex the epithelium becomes decidedly hypertrophic. The papillæ are not marked on the surface. This simple structure is complicated by inflammatory processes. The description of these inflammatory processes coincides as a whole very closely with that given by Fede. The diagnosis is fibroma and not papilloma, because only such neoplasms can be designated papilloma where the formation of the papillæ may be seen macroscopically. The authors incline to the opinion that the tumor represents a congenital deformity. The affection spreads itself in certain districts by means of heredity, and, therefore, remains limited to these districts. To the frequency with which it occurs in southern Italy much importance is attached. In the course of time it can occur in larger family groups, as, for instance, in adjoining districts. In this way a racial tendency can be called into existence, as with other affections. As analogous the authors cite the frequency of the keloid in the Ethiopic races and the occurrence of pigmentation on the nates of many newborns in Japan. In the tumor examined by Reinbach the hyperplastic epithelium sends irregular processes into the underlying tissue. The main part is underneath the epithelium. Here numerous bloodvessels are embedded in stroma of connective tissue rich in cells. The interstitial tissue between the larger vessels, which is rich in cells, too, is in places transformed into thin septa. Thus the type of a cavernous structure is nearly reached. The vessels only sparingly protrude into the papillæ. In the connective tissue circumscribed infiltrations are wanting. Nearly all the cells are connective tissue cells, and only a small fraction is composed of leucocytes. Underneath this layer are fibres of connective tissue, which is not rich in cells of itself, but which shows in several places a typical round-cell infiltration. Between the fibres numerous strings of cells are situated, representing young bloodvessels. Two explanations of the histological findings are possible. One is that the tumor is the result of a chronic inflammatory process; the second and more plausible lets the tumor appear as an angiomatous neoplasm, where the hypertrophy of epithelium is of a secondary nature easily explained by the irritation from the incisors. It is probable that the tumor

belongs to the group of the fissural angiomata of congenital origin. The pathological examination in Brun's case was made by Letulle, who found all the strata of the mucous membrane altered. The connective tissue of the mucosa is gorged with bloodvessels, for the most part strongly dilated capillaries. The meshes of the connective tissue are distended by lymph poor in white blood corpuscles. The elongated papillæ are rich in capillaries, which are larger than normal. The epithelial layer is hypertrophic. The centre of the tumor is ulcerated and covered with a pseudomembrane. On the surface a long bacillus was found and in the deeper layers of the pseudomembrane round micrococci, often arranged as diplococci, sometimes in chains; but no micro-organisms were seen in the tissue underneath the pseudomembrane. The growth is a chronic hypertrophy of the mucous membrane of purely inflammatory character. Microbes do not figure in its etiology. The affection which I had occasion to observe resembled macroscopically and microscopically very much the pictures given by Brun.

The microscopic examination furnished the following data: The whole tumor is covered with a thickened layer of pavement epithelium, except in its centre, where the epithelium is absent. The epithelium sends irregular processes of varying length and shape into the underlying tissue. The papillæ ascending between the epithelial processes are composed of connective tissue, which for the most part is not very rich in cells, but well supplied with partly distended capillaries. Occasionally the papillæ are richer in cells and the seat of a round-cell infiltration. The tissue under the epithelium contains a large number of bloodvessels, a part of which are distended. Besides this there are in places a great number of young bloodvessels, represented by strings of cells. The connective tissue is only in rare places comparatively poor in cells, while for the greater part the connective tissue cells are rather numerous. The connective tissue is nearly throughout the seat of a round-cell infiltration of various degrees; besides the round cells occasional polymorphonuclear leucocytes are seen, and in some places nearly all the cells are eosinophiles, which are freely distributed in other places, too. A number of plasma cells complete the picture.*

The centre of the tumor is, as mentioned above, denuded of its epithelium. Here is a mass consisting of detritus, round-cell infiltration, and fibrin. Occasionally a small deposit of fibrin is seen in the tissue adjoining this mass. It remains to be mentioned that all the different cells, mostly round cells, some polynuclear leucocytes, eosinophiles, and plasma cells penetrate into the epithelial layer in different places. In some places they invade the basal strata of the epithelium to a considerable extent, but they rarely wander deeper into the epithelium.

* According to Pappenheim,[29] the plasma cells are identical with the granulation cells.

The structure of the growth hardly permits of any doubt that it is a product of an inflammatory process. Whether the touching with silver nitrate plays any rôle as to the presence of the large numbers of cells with eosinophile granules is very doubtful, since several days had elapsed between this treatment and the excision; besides the occurrence of eosinophiles, for instance, in nasal polyps is common.[30]

As stated in the beginning, the affection occurs most frequently in southern Italy. Cannarsa, for instance, saw eight or ten cases at the same time among a population of about one thousand inhabitants. Callari and Phillipson, in Rome, found eight cases among six thousand children treated. Gaspardi and Santi state that infection is not so rare in middle and northern Italy as was thought. The affection known under the name of "brufolo" in Egypt, which occurs under the tongue or in the median line of the palate, may belong here. Malinowski[11] thinks he has seen several cases in Poland. From France the cases of Brun, Comby, Audard, and Dufournier[31] are reported; the latter case is somewhat doubtful. From Germany we have the reports of Israel and Reinbach, and from South America that of Olyntho.

The diagnosis does not present any difficulties. None of the cases reported had whooping-cough and only a few coughed slightly if at all.

The etiology of the affection remains obscure. The bacteriological examination thus far has not given satisfactory results. The theory of heredity is not sufficiently proven, neither is the congenital origin. Bad hygienic conditions of the mouth may be of importance. To the mechanical irritation produced by the lower incisors or by the hardening gum an important rôle is attributed. The possibility that any weakened condition of the baby may form a predisposition stands to reason; but some of the infants were apparently in the best state of health. The idea that the sublingual ingrowth is an integral part of a definite serious disease does not seem to be well founded. It seems possible that not all the affections of the frenulum described under the different names of the produzione sottolinguale are of a uniform pathological character, and then the etiology may differ with the different forms.

The age at which the affection occurs seems to be confined to the first two years of life, starting from about the third month, although Olyntho saw it in a four-year-old child. It does not seem necessary to enter upon the different modes of treatment which were proposed. The affection may disappear completely without any particular treatment; but the shortest and simplest way to accomplish a cure seems to be the excision.

The prognosis is favorable.

BIBLIOGRAPHY.

1. Atti dell' XI. congresso medico internazionale. Roma, 1894, vol. iii. Pediatria, p. 110.
2. Patologia e terapia dell' angina difteritica. Napoli, 1872 (translation of Werthimer's book).
3. Rendiconto academica medico-chirurgica di Napoli, 1875, p. 62.
4. Movimento medico-chirurgico, 1881, vol. xiii. p. 22.
5. Movimento medico-chirurgico, 1881, vol. xiii. p. 394.
6. Giornale internazionale delle scienze mediche, 1882, p. 585.
7. Giornale internazionale delle scienze mediche, 1882, p. 1197.
8. Archivio di Patalogia infantile, 1884, vol. ii. p. 156.
9. Atti del Congresso pediatrico italiano, 1891, vol. i. p. 251.
10. Atti del Congresso pediatrico italiano, 1892, vol. ii.; 1896, p. 237, etc.
11. Atti dell' XI. congresso medico internazionale. Roma, 1894, vol. iii. Pediatria, p. 110, etc.
12. La Pediatria, 1901, vol. ix. p. 513.
13. Gazzetta degli Ospedali e delle cliniche, 1899, vol. ii. p. 1493.
14. Gazzetta degli Ospedali e delle cliniche, 1900, p. 1581.
15. Revue mensuelle des maladies de l'enfance, vol. xx. No. 2.
16. La Pediatria, 1901, vol. ix. p. 514; and Archivio di Patalogia e clinica infantile, 1902, p. 44.
17. La Pediatria, 1900, vol. viii. p. 118.
18. La Pediatria, 1901, vol. ix. p. 139.
19. La Pediatria, 1900, vol. viii. p. 157.
20. Gazzetta degli Ospedali e delle cliniche, 1900, p. 224.
21. Gazzetta degli Ospedali e delle cliniche, 1899, p. 261.
22. La Pediatria, 1900, vol. viii. p. 145.
23. Jahrbuch für Kinderheilkunde, vol. li. p. 531.
24. Tribuna medica (Rio de Janeiro), 1897, vol. viii. p. 424.
25. La Pediatria, 1901, vol. ix. p. 492.
26. Beiträge zur klinischen Chirurgie, 1897, vol. xviii. p. 451.
27. Grancher, Comby et Marfan. Traité des maladies de l'enfance, vol. ii. p. 333.
28. La presse médicale, Paris, 1895, p. 25.
29. Virchow's Archiv, vol. clxvi. p. 480.
30. Lewy. Zeitschrift für klin. Medicin, vol. xl. p. 59.
31. La presse médicale, Paris, 1895, p. 80.

PRIMARY RETROPERITONEAL SARCOMA.*

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THE rarity of primary neoplasms in the subperitoneal space and the paucity of the available literature upon the subject induces me to report some cases of retroperitoneal sarcoma. To urge the importance of careful physical examination of all cases presenting persistent digestive disorders, the necessity of early diagnosis in obscure intra-abdominal conditions, and the possible benefits of prompt surgical interference in unusual abdominal growths is my excuse for presenting a paper based upon the records of several fatal cases of these infrequent growths. The diagnosis in two of these cases is based upon exploratory laparotomies; although they were seen too late to be benefited by radical surgery, the histories will be of interest as illustrating

* Read before the Macon Medical Society, December 17, 1901.

the clinical course of the disease and the pathological conditions revealed on the operating table during the lifetime of the patients.

N. G., female, white, aged twelve years, family history good, except that her paternal grandmother died of cancer of the breast; past history good up to August, 1899, when she fell from a jostling board, striking the right side of the abdominal walls sufficiently to produce some discoloration of the skin midway between the umbilicus and the crest of the ilium. Sometime after this fall she began to suffer with occasional attacks of vomiting and constipation, with decline of health. In November of the same year the mother thought she found a hard mass in the abdomen of the child, and took her at once to the late Dr. William F. Holt, who discovered a mass the size of an orange situated in the right side.

December 9, 1899, I was asked to see the case in consultation with Dr. Holt and Dr. McHatton. The tumor, then about the size and shape of a full-termed fœtal head, was easily found by vision and outlined by palpation, occupying the lower right quadrant of the abdominal cavity. It extended from the umbilicus to near the crest of the ilium, and from one and a half inches below the right costal border down to within an inch of Poupart's ligament. It was fixed in this position, or but slightly movable, and was uninfluenced by respiration. The surface of the growth, felt through the abdominal walls, was hard and irregularly nodular; crossing its middle portion from above downward and inward was a soft band the width of two fingers, which on percussion gave a tympanitic note, the mass on either side having a flat sound. The abdomen to the left was distended and tympanitic. A tympanitic sound existed between the lower border of the liver and the upper margin of the tumor. The right foot and ankle were slightly œdematous, and the child complained of some numbness of the limb. Occasional attacks of vomiting, with slight constipation, still persisted. There was no history of pain and but slight tenderness on manipulating the abdomen. But little wasting had occurred, though the child was beginning to show some cachexia. Temperature was normal, pulse 100° F., respiration 20. The stools were normal in color, but liquid from the use of laxatives. The urine was examined and found to be free from albumin, sugar, and casts. The specimen examined had a decided fecal odor, and under the microscope bacteria were abundant, with *some muscular fibre and vegetable cells, and disintegrating débris.*

A diagnosis of solid mesenteric tumor, probably sarcomatous, with possibly some connection between the urinary track and intestinal canal was given, and an immediate laparotomy advised.

12*th.* An operation was performed at the Macon Hospital. Assisted by Dr. F. W. McRae, of Atlanta (who had previously seen the case), Dr. McHatton, Dr. Weaver, and Dr. Wright, I opened the abdomen in the right iliac semilunaris. The omentum did not present, but the tumor readily filled the incision, although it could not be lifted out of the cavity. The growth apparently sprang from between the leaves of the mesocolon. It was an irregular, solid, grayish mass, presenting several hard nodules. Crossing over its surface were many large bloodvessels. There were not present any cysts or signs of elastic areas. Resting in a groove on its anterior surface from below upward, and from left to right, was present the colonic end of the ileum, the caput coli, and the ascending

colon; the vermiform appendix, suspended from the lower border of the growth, extended into the iliac fossa. The calibre of the bowel did not seem to be encroached upon. Depressing the edges of the incision, the hand could be passed down behind the tumor to its under borders. It was attached by a broad base to the posterior wall of the abdomen, just at the superior strait of the pelvis where the iliac vessels and ureter descended. These vessels were apparently embedded in the posterior surface of the mass. The pelvic visceræ were not involved. The right kidney could be freely outlined separate from the growth; the upper end of the ureter could not be felt enlarged. The transverse colon was found between the liver and the tumor. The omentum and small intestines were pushed over to the left side of the cavity of the abdomen. No omental adhesions or enlarged glands were present, although some small nodules in the neighboring mesentery and on the peritoneal surface of the anterior abdominal wall were found. Owing to the vascularity of the growth it was deemed inexpedient to take away any portion of the tumor for microscopic examination.

Because of the size of the growth, its broad attachment, its large blood supply, and its mesocolonic involvement, it was decided that any attempt to do a radical operation was inadvisable. The abdomen was therefore closed.

The child made an uneventful recovery from this exploratory operation, and went home in two weeks. For some weeks she could go about the house and ride out, but finally took to her bed. The tumor continued in its growth, and with it the œdema, confined at first to the right foot, extended to the external genitalia and both lower extremities. Painful cramps in the lower extremities and neuralgic pains in the lumbar and sacral regions developed. The digestive disorders continued unabated; a severe cough developed, with fever and loss of flesh and strength. The urine, repeatedly examined after the operation, continued free from albumin and casts, nor was there ever again any foreign matter found in the urine or fecal odor present after the one examination preceding the operation. (*This fact leads to the belief that the presence of muscular fibre and vegetable cells in the first urinary specimen was purely accidental.*) She died March 2, 1900, ten weeks after the exploratory laparotomy, and just four months after the tumor was discovered. No post-mortem examination was allowed.

E. B., female, white, aged five years, of good family history, and although regarded always a delicate child, of good past history, began, in the fall of 1900, to have some disorder of digestion. In January, 1901, she was first seen by Dr. W. R. Winchester. She was then suffering from anorexia, no pain, but distress after eating, nausea with occasional vomiting, and a constipated habit. The abdomen was swollen and tympanitic, but the doctor could discover no unusual growth. About March 1st he again saw her; the abdomen was greatly distended and a tumor was found in the right side; pain in the back was present; the previous digestive symptoms had increased; the child was emaciated and very weak.

On March 10th Dr. Winchester referred the case to me. The tumor at this time was fully the size of an adult head, extending from the right costal border to the brim of the pelvis, and from the right flank to two inches to the left of the umbilicus, posteriorly the mass could be outlined to the right of the spinal column. On palpation the growth

was smooth, firm, and resistant, without fluctuation, was fixed in its position, and uninfluenced by respiration. On percussion it was flat over its entire surface except a narrow area of slight tympany across its front. To the left and above the abdomen was distended and very tympanitic. There were no signs of ascites. The liver was pushed up above the nipple line. The veins in the right leg and abdomen were enlarged and full. There was no lymphatic enlargement either in the groin or in the neck, nor was there any enlargement of the spleen, nor pigmentation of the skin. There was a little œdema of the right leg below the knee. Pulse 110, temperature 100° F., respiration 22. The urine was free from sugar, albumin, and casts; no history of bloody urine.

A diagnosis of malignant abdominal tumor was given, and operative interference discouraged, owing to the enormous size of the growth and the evident weakened condition of the child.

Her parents urging a forlorn hope of possible relief, I reluctantly consented to perform an exploratory operation. On March 20th, at the Macon Hospital, assisted by Dr. Winchester, Dr. Carswell, and Dr. Wright, I opened the abdomen to the right of the umbilicus. The omentum, which was partially adherent to the tumor, was released and pushed to the left; some clear peritoneal fluid escaped, and the growth filled the long abdominal incision. The mass was smooth, of firm consistence, grayish-pink in color, exhibited no signs of cysts or nodules, and its surface was covered with thin-walled vessels which bled readily when handled. The ascending colon was flattened against the growth, stretched vertically over its anterior surface; the cæcum and appendix were free below the lower border of the growth. A short section of the small intestine was attached to the left anterior surface of the tumor by strong adhesions. None of the intestines connected with the growth exhibited any thickening or infiltration. The right kidney was pushed high up behind the ribs and was distinctly separate from the tumor. The liver was displaced upward and was separated from the mass by a sulcus containing the collapsed transverse colon and the stomach. The small intestines were pushed upward to the left side of the abdomen and were distended with gas. The other abdominal and pelvic viscera were normal. The growth was attached to the posterior and right lateral wall of the abdomen by a broad base, but did not encroach on the area occupied by the large vessels; it occupied the space between the two leaves of the mesentery of the ascending colon.

Such were the conditions found on opening the abdomen that no hope of doing a complete operation could be entertained. The wound was therefore rapidly closed and the child put comfortably to bed. She rallied from the anæsthetic nicely, and for forty-eight hours did fairly well, but began to go down and died of exhaustion thirty-six hours later. Unfortunately no post-mortem examination was obtained, hence a microscopic diagnosis of the character of the growth could not be made.

From the clinical histories and physical signs in these two cases, the age of the patients, the rapid growth of the tumors, the macroscopic appearances, and the anatomical positions found on exploratory examination, we may safely say that they were primary retroperitoneal sarcomata.

In the fall of 1883 I presented, at a meeting of this Society, a large abdominal tumor weighing six or seven pounds, which I had removed, post-mortem, from the body of a white woman, aged thirty-six years, married, and the mother of two children. I had not seen the woman *intra vitam*, but learned that she had died very suddenly with severe pains and collapse while in a rather weakened condition physically, and believed to be pregnant. On opening the abdomen it was found that the cause of death was intraperitoneal hemorrhage, the source of the bleeding being a ruptured vessel of large size and thin walls on the surface of the tumor. The growth was to the left of the descending colon, displacing it to the right and anteriorly; the bowel was attached to the mass loosely by its mesocolon, but its lumen did not seem to be obstructed. The small intestines and the other abdominal organs were freely displaced to the right of the tumor, and were not involved in its growth. At the time I exhibited the neoplasm I was uncertain of its nature, but my notes of the case show that later a microscopic examination was made of some sections by Dr. Longstreth, of Philadelphia, who reported it to be a lymphosarcoma.

In 1895, I think it was, with Dr. Ferguson, or someone else, I saw a fourth case of large abdominal tumor. My recollection is that the growth occupied the left side of the abdomen of a small male child, and at the time I gave a diagnosis of probable sarcoma of the left kidney, owing to its high position in the flank. The condition of the child was such as not to warrant an operation, and it shortly afterward died. A post-mortem examination was held, which, unfortunately, I did not witness; it was found that neither the kidney nor the spleen was involved, while the colon was attached to the growth. If I am not mistaken, the tumor was pronounced on microscopic examination to be a sarcomatous growth.* Such being the case, this tumor must also have been a retroperitoneal new-growth, and is the fourth I have seen in Macon during the past nineteen years.

The term "retroperitoneal solid tumors" is restricted to primary new-growths arising behind the peritoneum unconnected in origin with any of the solid viscera of that region. Reported cases of neoplasms of the subperitoneal tissues unconnected with the solid or hollow organs are by no means common, and the comparative rarity of records of retroperitoneal sarcoma is illustrated by the fact that in 14,630 tumors collected by Gurlt, of which 894 were sarcomata, only one case of primary sarcoma of this space is reported. Carcinoma, fibroma, lipoma, lymphoma, and sarcoma have been scantily referred to as having had their origin in these regions. Yet I cannot but believe that morbid growths occur in this space more commonly than the records show. A

* Dr. Ferguson being present recalled the case and confirmed my statements, giving in detail the findings at the autopsy and under the microscope.

great variety of tissues—nerves, bloodvessels, lymphatics, endothelial cells, and connective tissues—all tumor-bearing tissues, abound at the mesenteric base and in the retroperitoneal space, and their complex arrangements should invite the frequent proliferation of latent embryonic cells under physiological irritation constantly in process in the region involved. The fact that I have in a comparatively limited practice seen four cases of sarcoma in these spaces compels me to think that retroperitoneal morbid growths are met frequently by others, but not recorded. It is not the unusual situation of these growths, but the usually hopeless condition which explains the limited literature on the subject; doctors do not like to report hopeless or fatal cases, no matter how rare or interesting the disease. In the preparation of this paper I have found in some dozen surgical text-books only the bare mention of the possibility of finding morbid growths in the region back of the peritoneum. With the exception of two essays, which may be regarded as classical in their exhaustive consideration of the condition, I can find in the journals, annuals, society transactions, and hospital reports at my command only occasional references to the subject, and a few brief records of cases. Drs. M. L. Harris and M. Herzog have written a valuable paper on "Solid Mesenteric Tumors,"[1] reviewing the histology of the conditions and giving an abstract of fifty-seven cases gleaned from the medical literature of many past years. Dr. J. Dutton Steele's article, "A Critical Summary of the Literature on Retroperitoneal Sarcoma"[2] is a most estimable review of the subject based upon the clinical histories and pathological reports of sixty-one cases he has collected after "a somewhat exhaustive search." Of the fifty-seven cases of Harris and Herzog only ten were sarcomata. Scattered in other periodical medical literature previous to 1900, I find records of eleven other cases; and two new cases, one by Herzog[3] the other by R. R. Smith,[4] are reported since January, 1901. None of these are embraced in Harris and Herzog's abstracts, and if they are not included in Dr. Steele's list they bring the number of recorded cases up to eighty-four primary retroperitoneal sarcomata in the literature I have reviewed.

Sarcomata spring most often from the connective tissues of the sheaths of the great bloodvessels, the fibrous tissues about the spinal column, or from the lymph glands of the retroperitoneal space and the base of the mesentery. Two of my cases started from the lymph glands at the root of the mesentery, one evidently from the sheaths of the great bloodvessels, while the origin of the fourth I do not know. Steele says 64 per cent. have their origin in the retroperitoneal lymph glands.[2] Two were confined to the right side of the abdomen, the other two were in the left; Steele claims that the right retroperitoneal space is most often affected. These growths are usually solitary, and

they are of rapid growth. In my two cases in which exploratory operations were performed, the histories covered not over seven months from the beginning of the symptoms of disordered digestion; both were solitary growths. They occur at any age, but a large percentage of the cases reported occurred in late adult life. Thirty of Steele's cases occurred between the ages of forty and seventy years.[3] In Harris and Herzog's abstracts the age of all the cases of sarcoma was above thirty-five years, except two, aged five years, respectively.[1] Three of my cases were in children under twelve years, the fourth occurred at the age of thirty-six years. The disease affects both sexes equally; three of my cases were females. Steele says that traumatism does not seem to play much of a part in the causation, yet in three of his records there was some apparent connection between an injury and the development of the growth.[3] In one of my cases there is a distinct history of a blow on the abdomen preceding the discovery of the growth.

The affection is insidious in its onset, indefinite symptoms of a persistently rebellious and growing interference with the digestive organs are its earliest manifestations. Then come the symptoms due to direct pressure on the nerves and bloodvessels deep in the abdominal cavity. Finally, the rapidly growing mass reveals itself to the eye and hand. Unfortunately, unless the persistence of the digestive disturbances suggests an early physical examination the presence of the tumor will escape notice until it has reached such a size as to preclude its safe removal. The tumor is usually immovable, is uninfluenced by the respiratory action of the diaphragm, and can generally be separated from the liver or the spleen by an area of resonance. The position of the hollow viscera relative to the growth is of great importance in making a physical examination. This is demonstrated by a band of tympany crossing the mass, with dulness on percussion everywhere else over its surface. To Witzel belongs the credit of classifying the arrangement of the gut in the different positions of retroperitoneal tumors.[2] As the tumor increases in size it separates the leaflets of the mesentery and pushes the intestine forward. Thus, if the tumor is to the right side of the abdomen, the ascending colon is displaced forward and rests on the anterior and left side of the surface of the mass. The reverse of this position holds good when the tumor is on the left, the descending colon is outlined by a tympanic band on the anterior and right side of an easily established area of dulness. When the growth is centrally located the small intestines are arranged irregularly over the tumor surface; the transverse colon rarely crosses the surface of a median tumor, only three cases being recorded.[3] The two cases reported in detail in this paper are almost typical in their symptoms and physical signs.

These physical signs and symptoms are not characteristic of sarcoma

alone, but may be present with other neoplasms occupying the same area, nor do they exclude the presence of morbid growths originating in the solid organs of the abdomen. In forming a diagnosis, tumors of the liver, spleen, kidneys, and suprarenal bodies must be excluded by the absence of characteristic symptoms due to involvement of either of these organs. The early appearance of digestive disorders and pressure symptoms, the rapidity of the growth, and in children the age element would exclude other morbid growths and suggest sarcoma. In cases of doubt examination under anæsthesia will be necessary to make a probable diagnosis, while an absolute diagnosis can only be established by exploratory incision and microscopic examination.

The average duration of the condition is seven to eight months from the beginning of the initial symptoms up to the fatal ending of the case.[2] Metastases occasionally occur. In one of my cases nodules were found in the neighboring mesentery, and she evidently had a late involvement of the lungs. The usual termination is death from exhaustion. In the case seen by me only at autopsy death was caused by rupture and hemorrhage into the peritoneal cavity; the others died of exhaustion.

As to treatment: Laparotomy should be performed for two reasons: 1. Exploratory incision is the only sure method of establishing a correct diagnosis. 2. If the possible presence of a tumor is early recognized, a prompt surgical interference may cure the disease or prolong the life of the patient. Steele does not dwell upon the operative results in the cases he reviews, his article being confined to the pathology and symptomatology of retroperitoneal sarcoma. Harris and Herzog record eighteen radical operations in solid tumors of these regions, with ten recoveries;[1] three of the latter were recoveries from sarcoma. Of the ten cases of sarcoma they have reviewed, therefore, three had extirpations, and recovered. A later case reported by Herzog was not an operative case.[3] R. R. Smith's case had only an exploratory operation, the conditions found present not justifying a radical procedure.[4] Burgoin, of Paris, records twenty-nine extirpations of solid subperitoneal tumors, with fourteen recoveries; of these operations four were sarcoma, two died and two recovered.[5] Heurteaux, of Nantes, records a successful operation in a man, aged sixty years.[6] McCann, of Pittsburg, reports a case of retroperitoneal sarcoma successfully removed, with several inches of the small intestines.[7] Dunsmoor, of Minneapolis, reports a successful extirpation of a sarcoma in this region with intestinal resection.[8] Lleobet, of Buenos Ayres, reports a similar successful case.[9] As early as 1885, Cleaver Woods, of Australia, successfully removed a cystic sarcoma weighing two and one-half pounds from the retroperitoneal space in a child less than eighteen months of age.[10] Of eighty-four cases of retroperitoneal sarcomata, therefore, there were

twelve radical operations performed, with ten recoveries. These figures may not be conclusively correct, since some of the cases I have found elsewhere may have been included in the sixty-one cases upon which Steele bases his article, and, perhaps, in his list there may have been other operative cases which would swell the number of possible recoveries. However, a possible eighty percentage of recoveries in an operation for so fatal a malady as retroperitoneal sarcoma should induce us to give those patients suffering with obscure abdominal symptoms *always an early careful physical examination*, resorting to anæsthesia if necessary, exploratory incision if in doubt, and a prompt radical operation when there is a possibility of relief.

REFERENCES.

1 Annals of Surgery, July, 1897.
2. THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, March, 1900.
3. Journal of the American Medical Association, February, 1901.
4. Ibid., September, 1901.
5. Annals of Surgery, December, 1899.
6. Sajous' Annual, 1894.
7. Pittsburg Medical Review, March, 1892.
8. International Journal of Surgery, August, 1891.
9. Sajous' Annual, 1892.
10. Year Book of Treatment, 1886.

THE CONSTITUTION OF NORMAL PROSTATIC SECRETION.

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WHILE considerable attention has been bestowed upon the prostate from a surgico-pathological standpoint during the last few years, the normal gland* and its secretion have elicited but very little interest. In the various modern works on physiology, limited space only is allotted to a consideration of the prostatic fluid; the importance, however, which becomes attached to the organ when diseased makes it imperative to dwell upon the normal constitution of its secretion at somewhat greater length. Recognition of an altered secretion generally presupposes a knowledge of its normal composition. This is not the case with the

* Carl R. v. Hoffmann (Centralblatt f. Krankheiten d. Harn u. Sexualorgane, xii., 57) found that the normal gland weighs about 16 grammes, and that it contains 80 per cent. water and from 2.76 to 4.09 per cent. mineral matter. In the hypertrophied gland, both water and inorganic substances are present in larger proportions; the organic constituents, however, are considerably diminished. Na was present in the ash of the normal gland in much larger quantity than K; the occurrence of I was not demonstrated. Among the albuminous material a globulin substance resembling myosin and a nucleo-albuminoid were distinguished. Chondrin, elastin, and spermin were present. Lactic and succinic acids could not be demonstrated. From 1 to 2 per cent. of fat and cholesterin and some fatty acids were found to enter into the composition of the prostate gland.

prostatic juice, for normal prostatic fluid is only rarely subjected to examination.

The following description of normal prostatic secretion is based upon the researches of a number of investigators, and upon more than one hundred of my own observations.

The normal juice of the prostate gland, even when procured under the utmost precaution, is never entirely free from substances secreted by adjacent glands.

The physical characters of normal prostatic secretion which has been obtained by expressing the gland per rectum, and after micturition, may vary greatly in different individuals, and at different periods in the same individual.

Quantity. This is dependent upon age, glandular stimulation, frequency of ejaculation, habits, time of the day, and season. On certain occasions it may be absent altogether, but it may amount to 5 c.c. or more without exhibiting qualitative modifications.

Color. Normal prostatic fluid may present various shades of color. Most times it appears grayish-white; occasionally, however, it is yellow or blue-hued; in rare instances it presents a greenish lustre. The color of the semen is almost entirely dependent upon the color of the prostatic secretion.

Transparency The prostatic secretion always displays a more or less pronounced milky turbidness, which, to the greater extent is due to the presence of lecithin globules.

Odor. The characteristic odor of sperma according to Fürbringer[1] is due in part at least to compounds (of Schreiner's base) contained in the prostatic secretion. The latter substance is probably identical with ethylenimin (diethylendiamin). The odor, I think, may be likened to that emanating from withering blossoms of the horse-chestnut.

Consistency. Normal freshly-expressed secretion of the prostate gland is aqueous and occasionally slightly viscid. An eventual tenacity, however, may be caused by the admixture of secretions from neighboring glands.

Specific Gravity. The density degree of normal prostatic fluid is little higher than that of water, as the secretion contains but one or, at the utmost, two per cent. of solid matter. It is therefore considerably lighter than normal urine, which contains on the average about 95 per cent. of water.

The composition of normal expressed liquor prostaticus is dependent upon the same factors as is its physical condition. Within narrow limits it fluctuates in different individuals and at different periods.

Reaction. Normal prostatic fluid reacts mostly faintly alkaline; not infrequently it behaves neutral. In some instances the secretion reacted amphoterically. When not admixed with other secretions to any degree

prostatic juice hardly ever exhibits an absolutely acid reaction. Lohnstein,[2] on the other hand, found in 542 examinations of prostatic secretion derived from 80 patients affected with chronic prostatitis, the reaction acid in 404, neutral in 30, and alkaline in 108 instances. Apart from the fact that these observations were not made with secretions of normal prostates and the possibility of admixture of prostatic fluid and expression urine in a number of the 542 specimens obtained for examination, the unusually high percentage of acid liquor prostaticus seems due to the employment of phenolphthalein as an indicator. The various chemical indicators possess divers affinities and degrees of sensitiveness. I have seen phenolphthalein indicating an acid condition of the prostatic fluid when litmus either reacted not at all or pointed to an alkaline state; however, in a few instances I have met with the reverse condition, when, on the addition of a single drop of 0.1 per cent. alcoholic phenolphthalein solution, the prostatic secretion turned red, while litmus behaved like in an acid medium. The contrary behavior of these two indicators, I think, is dependent upon quantity and quality of phosphoric acid compounds contained in the prostatic fluid.

Salts of Hydrochloric Acid. Sodium chloride occurs in normal prostatic secretion in greater amount than any other single constituent. It is usually present in from 0.5 to 1 per cent. Calcium chloride is always present in appreciable quantities; potassium and magnesium chloride occur normally in traces only.

Salts of Sulphuric Acid. In the normal prostatic fluid calcium as well as magnesium sulphate occur in minute quantities.

Salts of Phosphoric Acid. Phosphoric acid is found in normal prostatic secretion in combination with sodium, calcium, and magnesium, with which it undoubtedly forms various salts. An eventual acidity of the secretion may be due to its contents of $Ca(H_2PO_4)_2H_2O$, NaH_2PO_4, and MH_2PO_4, which combinations, however, may have been derived from other sources than the prostate gland.

Albuminous Substances. Normal prostatic fluid contains from 0.35 to 0.75 per cent. of albuminous material, the principal among which seems to be nucleoproteids, fibrinogen, and mucin (mucinoid substance).

Enzyme. A specific prostatic ferment, causing coagulation of the contents of the glandulæ seminalis, was described by Camus and Gley.[3] They observed that clotting ensued in the semifluid neutral contents of the seminal vesicles of rodents on the addition of a drop of prostatic secretion. This coagulation is not produced by rennet, fibrinferment, or blood serum; organo-extracts, as those from the testicle, suprarenal capsule, kidney, liver, and pancreas, give rise to more or less pronounced agglutination of the contents of the seminal glands, but do not call forth their coagulation. The secretion of the prostate, on the other hand, does not produce alterations in either the blood or in milk.

The authors, who applied the name " vesiculase " to the enzyme, found its activity still unimpaired in liquor prostaticus from guinea-pigs aseptically preserved for a whole year. The enzyme is even not destroyed after the residue of the desiccated liquor has been subjected to a temperature of 140° C.

Lecithin and Cholin. The fatty nitrogen and phosphorus containing substance known as lecithin, a constituent of every cell, animal and vegetable, also enters into the composition of prostatic juice. The milky opacity of the latter is due, as we have already seen, to the presence of lecithin globules. They are of various sizes, the larger possessing about half the diameter of erythrocytes. They are often found embedded in the amyloid substance of the secretion. The occurrence in the expressed normal prostatic fluid of the only decomposition product of lecithin, cholin, was demonstrated by me in some instances. If, as asserted by Richter,[4] and later by Bocarius,[5] the production of Florence's crystals is due to the presence of cholin, then this reaction is not the exclusive indication of the presence of sperma, but occurs in all secretions in which cholin is contained. Whether prostatic lecithin is to be considered merely a product of waste or a potent constituent of semen is still an open question.

Amyloid Substance. Concretions giving amyloid reaction are so frequently found in the normal prostate and its secretion that they must be regarded as normal components of the gland as well as the fluid. These corpora amylacea, as they are called, are laminated, often finely granulated in the centre, and frequently exhibit a central nucleus or body. They vary considerably in size. When small they are round or ovoid; when they have attained larger dimensions they often become irregular on account of the deposition of crystalline substances.

According to Friedreich and Kekulé the percentage composition of the amyloid substance is C 53.6; H 7.0; N 15.0; S and O 24.4. Addition of iodine causes the amyloid substance to turn reddish; sulphuric acid and iodine change its color to violet or blue. It is dissolved by concentrated hydrochloric acid. A precipitate from this solution obtained by diluting the latter with water, reacts like acid albumin (hydrochlorate). Dissolved in a concentrated solution of potassium or sodium hydrate the amyloid substance is converted into an albuminate.[6]

The corpora amylacea apart from the iodine reaction have nothing in common with genuine amyloid substances, nor are they identical with vegetable starch. Posner[7] opines that their formation is partly due to coagulation of albuminous glandular contents, partly to cellular disintegration, and that lecithin in varying amounts frequently enters into their composition.

The smaller round and ovoid amyloid bodies, unmingled as they are with crystalline elements, are the most simple concretions occurring in

the body. All other animal concretions contain besides their organic base at least one mineral or crystalline substance.[6]

In the larger corpora amylacea (which mostly occur in elderly individuals in the composition of whose prostates mineral matters are the greatly preponderating solids) more or less inorganic material is found to be deposited as a rule. Calcification, however, will not ensue when lecithin had already been deposited into the framework of the amyloid body. These concretions, as previously stated, are of quite normal occurrence, particularly during advanced life, and are not infrequently discharged with the urinary flow. The larger irregular variety of prostatic calculi have been found to be composed of:

Water	8.0 per cent.
Organic substances (N = 2 per cent.)	15.8 "
Lime	37.64 "
Magnesia	2.38 "
Soda	1.76 "
Potash	0.5 "
Phosphoric acid	33.77 "
Iron	trace.

Prostatic Crystals. The crystals appearing in the seminal fluid, upon standing for considerable time, and known as Böttcher's crystals (although not completely identical with them), are closely related to the Charcot-Leyden-Neumann crystals. It was formerly thought that they were characteristic of the sperma itself, hence their name, "sperma crystals." According to Fürbringer, however, Schreiner's base, a component part of the prostatic secretion, supplies the basic portion of the crystals, while phosphoric acid—the prostatic crystals being a phosphate of Schreiner's nitrogenous base—is yielded by the secretion of the testes and the vesicula seminales. The crystals are therefore peculiar to the prostatic fluid, and their demonstration in a urethral discharge is no proof for the presence of sperms.

They occur in the form of colorless, transparent, needle or whetstone-shaped crystals, appearing rounded or cut off at the ends when imperfectly crystallized From the phosphorus containing semen they are obtained after the second or third day; in liquor prostaticus which is free from admixture with urine and the secretions of the testes, the seminal and Cowper's glands, and in which phosphorus is held in comparatively stable combination, they are produced by the addition of phosphorus only. This is accomplished best by adding one drop of a 1 per cent. solution of dibasic ammonium phosphate, hydrogen diammonium phosphate $(NH_4)_2HPO_4$, to a drop of prostatic fluid previously placed on a slide, and by permitting the preparation to dry under the cover-glass for about two hours. The fact that after death these crystals are found in the contents of the prostate only, and not in

that of the other accessory sexual glands or in the testes, is further proof of their prostatic origin.

Morphological Elements: Epithelium. The columnar variety, lining the canals as well as the terminal prostatic vesicles, is most frequently distinguished in expressed normal prostatic fluid. Squamous epithelium also occurs in the normal secretion of the prostate, but it is not so common as the cylindrical type. Round epithelia appearing in the prostatic fluid resemble very much those coming from the ureters. They are most always finely granulated and frequently possess two or more nuclei; however, they appear but rarely in the normal secretion.

Leucocytes. A few leucocytes, mostly polynuclear, are found in the normal juice of the prostate.

Erythrocytes. Erythrocytes are not invariably present, but some red corpuscles occasionally occur in the normal secretion.

Hyaline Material. Some globules of hyaline material, perfectly clear and frequently of considerable diameter, are contained in normal liquor prostaticus.

The constitution and complexity of the prostatic secretion at once preclude its physiological indifference and inactivity, and let it appear as an important factor of and in the seminal fluid. Recognition of the potency of prostatic juice relegates to the rear the former assumption that the prostate was rather a part of the urinary than of the sexual apparatus, and furthermore tends to draw the attention of the internist to an organ which the genito-urinary surgeon since time immemorial has been wont to accept as his exclusive domain.

Kraus already maintained that the spermatozoa cannot preserve their vitality in the uterine mucosa in the absence of prostatic secretion, but that in its presence they retain their physiological potency often longer than thirty-six hours. Steinach[9] and others found that in white rats, after the extirpation of the prostate and seminal vesicles, impregnation of the ova will not occur although the spermatozoa continue to be discharged.

All observers practically agree:

1. That the nucleus of the spermatozoon is the fertilizing element.
2. That the spermatozoon is enabled to maintain its active motion in a suitable medium only.
3. That such a medium is furnished by the secretion of the accessory glands, mainly by that of the prostate and seminal vesicles.
4. That the secretion of the accessory glands may perform other important functions.

It is as yet impossible to single out the *specific* importance of the prostatic fluid. Maybe it is due to its enzyme exhibiting coagulating properties; maybe to the phosphorus containing lecithin, which occurs in abundant amounts; maybe to some of the nucleoproteids whose *raison*

d'être has still to be determined; maybe to a combined action of any or all these constituents, or to another factor altogether.

On the other hand, there can be no doubt as to the *physical* importance of the prostatic secretion. It serves as a vehicle for the suspension, protection, and preservation of the spermatozoa. The prostatic fluid by enveloping, so to speak, the spermatozoon, protects it from external influences, as contact with air and such physiological or pathological discharges which are detrimental to its vitality. The secretions of the other accessory organs, of course, contribute in proportion toward the protecting and preserving medium.

Dilution of the seminal fluid by water calls forth cessation of movement, loss of fecundating qualities, and disintegration of the spermatozoa. Artificial impregnation of dogs and other animals has been effected, however, by injecting into the vagina spermatozoa obtained directly from the canal of the epididymis which were suspended in a 0.5 per cent. solution of sodium carbonate. These experiments conducted by Iwanoff[10] do not at all negate the essentiality of prostatic secretion in the process of fecundation. On the contrary, they let the necessity of prostatic fluid appear in a new light: the facts, namely, that the addition of pure water to the seminal fluid destroys the spermatozoa while they retain their vitality in a weak solution of sodium carbonate, clearly evince that pure water is a poison; that is to say, that it is hypotonic and that a 0.5 per cent. sodium carbonate solution is isotonic (or hypertonic) to the spermatozoa. The osmotic conditions in the seminal fluid or in normal prostatic juice alone must be similar to those in a 0.5 per cent. solution of sodium carbonate. We will, therefore, not be very far from the truth in assuming that apart from an eventual specific chemico-enzymic potency, the secretion of the prostate gland is of importance in overcoming the quiescence of the spermatozoa, and in effecting that state of osmosis in the seminal fluid which is essential to fecundation.

References.

1. P. Fürbringer. Zeitschrift f. klin. Med., 1881, vol. iii. p. 310.
2. H. Lohnstein. Ueber die Reaktion des Prostatasekretes bei chronischer Prostatitis und ihren Einfluss auf die Lebensfaehigkeit der Spermatozoën. Deutsche med. Wochenschr, 1900, pp. 841–844.
3. L. Camus et E. Gley. Comptes-rendus de la Société de Biologie, vol. xlviii. pp. 787, 788, and vol. xlix. pp. 787–790.
4. M. Richter. Der mikrochemische Nachweis von Sperma. Wiener klin. Wochenschr., 1897, vol. x. 24.
5. N. Bocarius. Zur Kenntniss der Substans welche die Bildung von Florence'schen Krystallen bedingt. Hoppe-Seyler's Zeitschr. f. Physiologische Chemie, 1902, vol. xxxiv. p. 339.
6. F. Hoppe-Seyler. Handbuch der physiol. und pathol-chemisch. Analyse, 1893.
7. C. Posner. Studien ueber Steinbildungen. Zeitschr. f. klin. Med., 1899, vol. xvi. p. 144.
8. C. Posner. Ueber die Steinkrankheit. Berl. klin. Wochenschr., 1887, vol. xxiv. 27.
9. E. Steinach. Pflueger's Arch., 1894.
10. Iwanoff. Journal de Physiologie et de Pathologie générale, 1900.

RHEUMATISM *vs.* MUSCULAR AND JOINT PAINS.[1]

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I have had occasion to point out several times that many of the cases that come to the outdoor service of the Polyclinic Hospital with the ready-made diagnosis rheumatism are really examples of muscular and joint pains due to quite other causes. Among the most prominent causes are: in the lower extremities, flat-foot; and in the upper extremities, occupation brachyalgias and shoulder pains of various kinds, due to the excessive or faulty use of muscles. During the past year I have had occasion to see a number of other conditions that were considered by the patients themselves to be rheumatism, and, as a rule, had been so diagnosed by physicians before they came under observation at the dispensary. As some of these cases illustrate very well certain forms of pseudo-rheumatism, and show how a little investigation will enable the practitioner to meet the exact indications of the case, while the diagnosis rheumatism would make the therapeutics hopeless, I have considered that it would be interesting to describe some of them:

A typical case was that of a young woman, aged twenty-eight years, who said that she had been suffering for some years from rheumatism, for which she had received treatment. She had pains especially in the hands and feet, and the discomfort was felt more in the fingers and toes than further up in the limbs. There was, however, a distinct tendency for the knees and elbows to suffer, at least, from paræsthesia, and occasionally from more acute discomfort. The painful condition had given rise to the idea of rheumatism in her mind, and she had persuaded her physician to treat her on this ready-made diagnosis.

A little questioning showed that she suffered from whiteness of the fingers and that occasionally they were dark blue or dusky red in color. The pain in them was not that of acute congestion with consequent sharp-cutting pain, but was of a more or less burning character. Some of the other subjective symptoms, especially those in the elbows and knees and shoulders, were remindful of the cases described by Schultze, of Bonn, as acroparæsthesias, because they involve disturbances of sensation that are sometimes painful, occurring, especially, wherever there are tissue endings, that is, at joints as well as in the ends of the limbs.

The affection was evidently not rheumatic, but was due to one of the nervous diseases that lie on the borderland between Raynaud's disease in its milder forms and S. Weir Mitchell's disease, erythromelalgia,

[1] Read before the New York Celtic Medical Society.

the occasional whiteness of the fingers and then their redness and pain partaking somewhat of the symptom complex of both of these diseases. What was needed in the case was evidently not depressant rheumatic remedies, and especially not the coal-tar products that are unfortunately so abundantly and irrationally used for so many forms of nervous and muscular discomforts, but rather tonic and supporting treatment so as to bring her general health up to its highest standard, and restore tone to her nervous system. Under an ordinary iron tonic with strychnine she has improved considerably, and though she still has discomfort at times, she does not complain as before.

It must be borne in mind that in neurotic conditions pain is a very relative affair. In highly excited neurotic states even a little discomfort may come to seem almost unbearable pain. Nervous women who simply suffer from ordinary fatigue, after unusual exertions will describe their feelings as if they had acute pain in their joints. Where a definite nervous disease with an organic basis exists, there is almost sure to be a development of accessory neurotic symptoms, partly hysterical, partly neurasthenic, which are likely to complicate the diagnostic problem. Not infrequently it will be found that true organic nervous diseases were treated originally as rheumatism, or as some form of rheumatic neuralgia, sciatica, lumbago, or the like. The lightning pains of locomotor ataxia may masquerade thus as rheumatism for some months before the diagnosis is made. I have recently had such a case of tabes come under my observation, in which the lightning pains took the form of sciatica, and were diagnosed and treated as sciatic rheumatism. A case of neuritis of traumatic origin, but so distinctly limited to the distribution of the ulnar nerve as to make the patient an excellent living illustration especially of its peripheral terminations, had also been diagnosed and treated as rheumatism.

A very interesting set of cases of pseudo-rheumatism were those noted as occurring in connection with scoliosis. Within a year there have been seven of these cases under observation in the Out-patient Department of the New York Polyclinic. Practically every patient who suffers with scoliosis will complain of vague pains around the shoulder, usually worse on rainy days, and especially liable to be the source of constant complaint if much work is done with the arm of the affected side. Even slight amounts of scoliosis will be sufficient to cause discomfort in delicate and nervous patients, as those affected with lateral curvature so frequently are.

The cause of the discomfort seems to be the fact that the muscles of the shoulder are used at a mechanical disadvantage, because of the more or less alar position the scapula assumes in cases of scoliosis. It is on the side on which the scapula is more prominent that the discomfort occurs. A little consideration will show that the muscles of the

shoulder girdle on this side, especially those that have attachments to the scapula, are employed under quite different mechanical conditions to those which normally obtain. Such muscles as the deltoid are apt to be overused, or used awkwardly in the effort to make up for the malposition of the scapula and the failure of its muscles to accomplish their purposes properly. For these cases, if not too far advanced, exercises that will equalize the strength of dorsal muscles so as to retain the scapula in position will often do good. The employment of the trunk muscles to raise up the upper part of the body, as when the patient leans far out of bed, touches the floor, and then lifts up the head and shoulders by the dorsal muscles alone, often accomplishes this purpose of getting the scapula back to its normal position. Needless to say, such exercises must not be done to excess at the beginning, or they will greatly add to the discomfort and do more harm than good.

A very interesting case of pain localized in certain muscles occurred in an arthritic neurosis of the knee, consequent upon the pinching of a loose cartilage in the joint. The joint symptoms occurred suddenly on two or three occasions, so that for a time a surgeon deemed it wise to put the knee up in plaster. As a consequence a certain amount of atrophy of the muscles of the leg developed and a halt became habitual in the gait. As the result of this halting gait, the muscles of the back on the same side were also spared somewhat in their employment and a certain amount of atrophy occurred. Painful conditions developed in the muscles of the other side of the back from overuse in order to compensate for the condition on the less used side. All of the muscles on the affected side became painful, apparently because of the more or less atrophic conditions to which they had been reduced. The discomfort was more on rainy days, perhaps because of lack of tone.

The young man deeply interested in his business, and with the best of good will, is utterly unable to conquer the tendency to halt in his gait, and as a consequence the muscles remain underexercised and used at a mechanical disadvantage, with the usual painful result. He has been to at least two prominent orthopedic surgeons, who have assured him that all he needs is confidence in himself to walk straight, and the normal condition of muscles with absence of pain will be the result. Their directions have been absolutely without result. He has been in the hands of masseurs, of osteopaths, of rubbing quacks of all kinds, with at least two attacks of artificial eczema as a consequence of the use of turpentine liniments, but he remains to the present time in what he considers himself an intensely miserable condition, from which he would give almost anything (and he is reasonably prosperous) to secure relief. Sooner or later he will fall into the hands of some sort of a "pathic" professor who will inspire him with confidence enough to get him to walk straight, and then he will herald his benefactor to all

his friends as the greatest healer that ever happened. Such is medical practice.

Anyone who has seen a number of hysterical joints, and realized what a source of complaint they may be for patients, will recognize that not a few of the supposed cases of obstinate subacute rheumatism, in young women and other persons of neurotic disposition, are really due to something of this nature. The pain in itself may be comparatively trivial, but to an excited nervous system it may seem unbearable. Not infrequently after a slight attack of genuine acute rheumatism there remain painful conditions of which very serious complaint is made. These constitute a not unimportant number of the cases of rheumatism that are said to be unimproved by salicylic treatment. Not infrequently there is apparently a skipping around of the disease, so that joints are successively affected, now one, now another, with relapses in those already relieved. It need not require a true attack of rheumatism to awaken such conditions, but slight trauma or a sprain, or the fatigue of carrying the walking skirt, on a damp day particularly, may give rise to the painful condition.

I have recently seen a case of slight hysterical contracture, in which a series of pains that had been treated for rheumatism developed, and failed to yield to the ordinary rheumatic remedies, as might have been anticipated. In this case there had evidently been an affection of the hip of a neurotic character treated unfortunately by splinting, and with consequent contraction of muscles with about an inch of shortening. This was overcome by wearing a heel about one-half inch higher on one foot and by raising the foot within the shoe another half inch. The pains developed in the other leg and partook of the nature of sciatica. To my mind they were due to the fact that this leg was being used to support the weight of the body much more than would normally be the case, and as the young woman had an occupation as librarian that kept her on her feet a good deal, this made an important factor.

The use of depressant rheumatic remedies had in this case proved very unsuitable. The nervous system, at best, was in a condition of lowered tone, and this was increased. The general nutrition, too, was rather seriously disturbed and had been still further interfered with by the administration of various coal-tar remedies. Under the careful regulation of life so as to avoid much standing, of the diet so as to secure improved nutrition, and with longer hours of rest the case has improved, though necessarily slowly. It is probable that there will always remain in a neurotic constitution like this a distinct tendency for painful conditions to develop in the muscles of the limb that must necessarily be overused.

Tuberculous patients often complain of pains at the bases of the lungs,

especially in front and along the sides, which are sometimes thought to be of pleuritic origin. As a matter of fact, these pains are often due to the compensatory work required on the part of the healthy lung to make up for the diseased one, or on the part of the lower lobes of a diseased lung to make up for the upper lobes in activity. As the result of the presence of the tuberculous process it is well known now that nature at once endeavors to set the affected lung at rest. This is accomplished by causing the diaphragm of the affected side to make excursions of less length than before. The earliest symptom of tuberculosis is the lessened excursion of the diaphragm as seen by the X-rays, or as it can be seen by the naked eye, if one looks for the Litten phenomenon in a proper light, or as it can be demonstrated by percussion of the bases of the lungs alternately in full inspiration and expiration.

The other lung, as is well known, attempts to compensate for the resting one, and there is a greater excursion of the diaphragm on the affected side and an increased expansion of the chest that can be demonstrated with a tape measure. As a consequence of this muscles are overused, and the half of the diaphragm on the well side is apt to be somewhat strained by the unusual exertion. As is the case with any muscles doing unaccustomed work, tired, achy feelings develop, especially in delicate subjects, and these may even assume the character of neuralgic pains.

There is a curious tendency manifest in some of these cases for the pain in the chest to be reflected down the arm, or, at least, for an achy feeling to occur in the arm that adds something like confirmation to the diagnosis neuralgia or rheumatism in these cases. It may even seem to point surely to the diagnosis of pleurisy, since so often in pleurisy there is pain in the arm of the affected side. The nervous mechanism underlying the reflected pain in these pseudo-pleurisy cases is the same as that which causes pain in real pleurisy. The intercostohumeral nerve is affected in its terminal endings in the intercostal muscles, and as these are overworked, because of the compensatory labor of the unaffected lung, there is a reflexion of the painful sense of weariness along the terminal endings in the humerus. A realization of these anatomical and physiological conditions will often save patients and physicians from needless worry as to the true cause of these uncomfortable sensations.

As the result of the presence of tuberculosis, such pains are sure to be spoken of as pleuritic in character. If there is considerable involvement of the apex of one lung, or slight involvement of the apices of both lungs, then the lower lobes of the lung do compensatory work. The consequence is nearly the same as when one lung makes up for the other. These pains at the bases of the lungs are sometimes spoken of as rheumatic. They constitute, in fact, one of the reasons for considering that pleurisy may be of rheumatic origin, the only reason being that

wherever there is pain for which no simple explanation is forthcoming, the word rheumatic is at once used.

The treatment of these cases consists not in the administration of analgesic remedies, and especially not of the coal-tar products supposed to be specific antirheumatic remedies, but of gentle rubbing and massage and of limitation of the exercise of the patient in such a way as to prevent that overuse of the respiratory muscles that is sure to be called for if, with one lung practically at rest, the patient attempts any of the ordinary efforts that before were so easy of accomplishment.

The pain may be considerably modified, as a rule, by strapping the parts so as to limit the amount of movement; after this, of course, patients will have to be advised to rest as much as possible, keeping in the air, however, as the recent therapy of tuberculosis has shown this to be the very best remedy for the aches in the chest so often complained of by consumptives.

ORTHOSTATIC ALBUMINURIA AND MOVABLE KIDNEY.

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A variety of names has in the course of time been applied to that condition of albuminuria first described by Pavy as "cyclic." He laid stress on the fact that the albuminuria disappeared when the patient went to bed, and soon afterward Stirling pointed out that the albuminuria was induced by the adoption of the erect posture, and suggested the name "postural albuminuria." Still more descriptive was the term "orthotische albuminurie" introduced by Heubner, the idea of which is more pleasantly expressed by Merklen and Teissier as "albuminurie orthostatique." This name, orthostatic[1] albuminuria, will probably commend itself to the profession generally as being more descriptive and more agreeable to the ear than any of the others.

Orthostatic or cyclic albuminuria is a condition which must be clearly defined, owing to its being frequently confused with other forms of intermittent or so-called functional albuminuria. It is characterized by the appearance of albumin in the urine soon after the patient assumes the erect posture, as on rising from bed in the morning, and by its disappearance on his assuming the recumbent posture, as on going to bed. It is not accompanied by any definite evidences of organic renal disease, such as hæmaturia, tube casts, low specific

[1] From ὀρθός upright, and ἵστημι I stand.

gravity of the urine, cardiovascular disease, or retinal changes, nor has it ever been known to terminate in organic renal disease. On the other hand, it must be remembered that in the earlier stages of renal disease, albumin may be present only when the patient is out of bed and taking exercise. Such cases are not to be confused with those of orthostatic albuminuria, and can easily be distinguished by the above tests. So far my own experience has been that the most common form of the so-called "albuminuria of adolescence" is orthostatic albuminuria. Another form, described by Dr. Clement Dukes, is associated with a high-tension pulse, and must be put in a different category. In orthostatic albuminuria the pulse tension is normal or lowered, and there is a characteristic want of tone in the whole vascular system. It must always be remembered that in speaking of orthostatic albuminuria we are referring to a symptom and not to a disease. The symptom has been carefully studied by many, but the disease has not yet been definitely ascertained. The view most commonly accepted is that there is a disturbance in the central nervous system which produces vasomotor weakness in different parts of the body, and more especially in the kidneys.

I have written fully elsewhere on the etiology, the pathology, and the prognosis of orthostatic albuminuria, and have discussed the literature of the subject up to the year 1900.[1] In this paper I propose to confine my remarks to the association between orthostatic albuminuria and a movable condition of the kidney or kidneys during early adolescence.

Cases of Orthostatic Albuminuria and Movable Kidney.

Case I.—F. B., female, aged seven years, was seen for the first time in March, 1895. She had been strong and healthy until two years previously, when she was seized with vomiting and severe pain in the region of the umbilicus. Similar attacks had occurred at intervals, with great prostration, weakness, and loss of flesh. The child was poorly nourished and of a highly nervous temperament, shy and emotional. Physical examination revealed no objective signs of disease, and it was not until October that albumin was detected in the urine, which was present only when the patient was out of bed. Repeated examination showed a characteristic condition of orthostatic albuminuria, without any evidences of organic or renal disease. Two years later (April, 1897) the patient again came under observation, at the age of nine years. She had suffered at intervals from lethargy, debility, abdominal pain, and headache. Seven months previously she had been seized with severe pain in the abdomen and vomiting. An acute illness of a week's duration followed, during the greater part of which she was delirious, and after which she was left in a very exhausted condition, with pain and tenderness along the spine. A diagnosis of meningitis had been made, but the rapid disappearance of all

[1] Cyclic Albuminuria. London, 1900.

nervous symptoms seemed to disprove this. Examination of the urine showed the persistence of orthostatic albuminuria. Two years later (April, 1899) she was again seen at the age of eleven years. She was kept in the recumbent position for five days, and during that time no albumin was present in the urine. Four hours after rising the urine passed was found to contain a large amount of albumin.

A year later (May, 1900) she was practically in the same condition as regards the orthostatic albuminuria. At this time careful abdominal examination showed a large, freely movable body on the right side, extending three inches below the ribs, which was evidently the kidney. It was slightly tender, and when firm pressure was made the patient complained of pain in the umbilical region, similar to that which had characterized the acute abdominal attacks. The left kidney could be felt, but was not movable with respiration. There was marked abdominal aortic pulsation. These conditions have continued unchanged.

Case II.—A. L., female, aged eleven years, was seen for the first time in November, 1896, suffering from headaches, vomiting, and swelling of the eyes. She had never had scarlet fever. A condition of orthostatic albuminuria was determined. At the age of fourteen and a half years (May, 1900) she was again seen, and the same condition of the urine was present. Menstruation had been established at the age of thirteen years. There was marked abdominal aortic pulsation. The right kidney was distinctly palpable, and moved freely with respiration and on manipulation. It seemed to be somewhat enlarged. The left kidney could not be felt.

Case III.—F. F., female, aged eleven years, was seen in August, 1900. She had been suffering for six months from epistaxis, giddiness, and headache. For some six weeks she had been very languid and depressed, and her night's rest had been broken by dreams and somnambulism. A condition of orthostatic albuminuria was determined. There was a history of abdominal pain at times, but on physical examination the kidneys could not be felt. At a subsequent examination both kidneys were easily felt, moving freely with respiration, and apparently somewhat enlarged. After rest in the recumbent position for twenty-four hours the kidneys could not be palpated.

Case IV.—E. G., female, aged ten years, was seen in August, 1900. She had been ailing for some time with vague pains in the limbs, and was easily tired and easily depressed. Her sleep was broken by night terrors. A condition of orthostatic albuminuria was determined. There was no marked abdominal pulsation, and the kidneys were not felt. In May, 1901, the following note was made: The abdominal wall is very thin and lax; a condition of general enteroptosis seems to be present; the liver descends markedly on respiration; the left kidney is distinctly palpable and moves with respiration; the right is not so distinctly felt; there is marked aortic pulsation in the abdomen. These conditions were confirmed at subsequent examinations during the following months. At times the right kidney was extremely movable. Orthostatic albuminuria had persisted unchanged.

Case V.—J. W., male, aged twelve years, was seen in December, 1901. He had been attending the hospital at intervals for the previous five years. His symptoms had been headaches and vomiting, great lassitude, pains in the ankles and wrists, restless sleep, and attacks of severe pain in the left side of the abdomen. He was a well-nourished

boy, with a very dark skin and pigmentation around the eyes. At times swelling of the eyelids and ankles had been noted. He was extremely nervous and emotional, weeping on the slightest provocation. Physical examination showed no signs of definite organic disease. There were marked pulsations of the abdominal aorta, but the kidneys could not be felt. Repeated examinations of the urine showed a condition of orthostatic albuminuria without any sign of organic renal disease. In June, 1901, it was noted on abdominal examination when the patient was lying down, that the right kidney was movable, passing one and one-half inches below the ribs on inspiration. It was not enlarged, or tender, or pulsating. The left kidney could not be palpated. Marked aortic pulsation was also present. These conditions have continued for some months without any appreciable change.

CASE VI.—M. T., female, aged seven years, was seen in June, 1901. For two months she had been growing thin and becoming tired on the slightest exertion. Pain in the right side of the abdomen had been complained of, and "bilious attacks" with vomiting had occurred. The abdomen was soft, there was abnormal aortic pulsation, and a rounded mass could be felt in the right hypochondrium, freely movable, and not tender. This was evidently the right kidney, and it was situated in the position where pain had been several times localized. The kidney passed two inches below the ribs, was freely movable with respiration, and could be pushed up under the ribs. The left kidney could not be felt. Orthostatic albuminuria was determined, both serum and nucleo-albumin being present, sometimes in considerable amount. There were no casts and no evidences of organic renal disease. She has been under observation for some months, without any appreciable change in the above local conditions.

CASE VII.—E. L., female, aged eight years, was seen in December, 1900. She had been complaining of pains in her legs and arms for some months, and had suffered from lassitude, headaches, and night-terrors. Her previous health had been good, apart from scarlet fever two years and gastric fever six months previously. Her mother suffered from dropsy and Bright's disease of six years' duration. A condition of orthostatic albuminuria was present, but the abdominal organs were normal on palpation. She came under observation again in September, 1901, suffering from the previous symptoms in an aggravated form. There was much albumin in the urine after rising. Both kidneys were easily palpable, moved freely with respiration, and were apparently enlarged.

CASE VIII.—D. S., female, aged eleven years, was seen in February, 1901. She was complaining of general debility, pains between the shoulders, tiredness, and shortness of breath. The child was of an extremely nervous temperament, with an anæmic look, and large pupils. The abdomen was firm. There was marked aortic pulsation, and the right kidney could be felt. It was apparently enlarged, and moved with respiration, so that it could be fixed between the hands on deep respiration below the level of the ribs. The left kidney was not felt. A condition of orthostatic albuminuria was present, of which the only special point to note was that nucleo-albumin was very rarely present and was never more than a faint trace. The amount of serum albumin varied from day to day, but was usually such as to give a very definite reaction to all the tests. Strapping and bandaging of the

abdomen were employed in this case, but without producing abolition of the albuminuria, although it appeared to diminish it at times.

Case IX.—L. N., female, aged ten years, was seen in February, 1901. She had been drowsy and out-of-sorts for some weeks, easily tired, and wanting to lie about. She was extremely sensitive and emotional, so that her mother could not understand what had come over her. She had had scarlet fever two years and diphtheria one year previously. She was a thin, tired-looking girl. Orthostatic albuminuria was present. The right kidney was palpable and was apparently somewhat enlarged. It was not freely movable with respiration, but could be pushed about easily. The left kidney was not felt.

Case X.—L. C., aged fourteen years, was seen in March, 1901. She had suffered from measles and whooping-cough, but had never had scarlet fever. Fourteen months previously she had an attack of chorea, and since then had never been quite well. She had complained of palpitation and shortness of breath and had become nervous and languid, so that her school lessons were a constant worry to her. The girl was of a spare build, with cold and blue hands and feet, and with an anæmic skin, which flushed very readily on excitement. There was a definite swelling in the neck, which had been noticed for a fortnight, and was due to a goitre. It varied in size from time to time, but was not pulsating, although there was abnormal pulsation in the carotids and in the abdominal aorta. The cardiac action was 100 per minute and regular. There was no murmur present, and pulse tracings showed nothing abnormal. Other signs of Graves' disease were not present. Orthostatic albuminuria was determined, the amount of albumin being usually small, but sometimes it amounted to 1 or 2 per cent., by Esbach's method. There were no evidences of organic renal disease in the shape of casts, arterial changes, etc. The right kidney appeared to be enlarged and was felt to be freely movable. The left could not be palpated. There was a history of attacks of abdominal pain, not specially localized, but none occurred while the patient was under observation.

Case XI.—F. A., female, aged thirteen years, was seen in June, 1901. She was brought to the hospital because of her being always tired, of headaches, and of pains in the legs and ankles. She was a well-nourished, rapidly growing, lethargic girl, with a marked condition of flat feet, which no doubt caused the pain complained of. Her eyelids were puffy, and the face generally was rather swollen. There was a slight cardiac enlargement to the left, with a soft (hæmic ?) murmur at the apex. On the left side of the abdomen a lump was felt in the situation of the left kidney, freely movable, not tender, not pulsating. It could easily be palpated between the two hands, and on deep inspiration passed downward and inward almost to the level of the umbilicus. It appeared to be an enlarged left kidney. On the right side of the abdomen a similar lump was felt, but not so large nor so freely movable. It had a rounded margin anteriorly, but was not tender, and could be readily palpated. A condition of orthostatic albuminuria was determined, with an excess of urates in the urine, but no signs of organic renal disease. There was no abnormal aortic pulsation, and no abdominal pain was complained of. No other signs of enteroptosis were present, and the abdominal wall was firm and unyielding in the erect posture.

On repeated examination it was found that on some days the kidneys were much more palpable than on others, and that they appeared to vary in size. Rest in bed always led to the disappearance of the albuminuria, but never of the kidneys.

Case XII.—A. H., male, aged ten years, was seen in September, 1901. He had been having fainting attacks at school and complaining of pain in the belly. He suffered much from headaches, and was subject to a feeling of sickness on rising in the morning. There was no history of scarlet fever, and the only serious illness he had had was erysipelas, following a cut on his head eight years previously. On admission, a condition of orthostatic albuminuria was determined, although albumin was not invariably present after rising. There was no evidence of organic renal disease. He had occasional attacks of acute abdominal pain in the right hypochondrium, with nausea and faintness. The right kidney was quite palpable between the hands, and passed about two inches below the costal margin. There was no tenderness, and the kidney could be moved freely in all directions. The left kidney was not felt. At times the right kidney seemed to disappear, like the albumin, but it was not clear that these changes happened at the same time.

Case XIII.—B. D., female, aged eleven years, was seen in October, 1901. She had suffered from convulsions since infancy, and had scarlet fever at the age of five years. She was a very nervous child, well nourished, and with a blotchy skin. Orthostatic albuminuria was present without any evidence of organic renal disease. The right kidney was palpable and freely movable. The left kidney was not felt. The effect of strapping and bandaging the abdomen was tried, and it was thought that the amount of albumin was diminished, although the albumin never disappeared entirely.

Case XIV.—N. D., female, aged eleven years, was seen in September, 1901. She had been suffering from languor and tiredness, attacks of feverishness, with loss of appetite, headache, and abdominal pain. Her only serious illness had been diphtheria four years previously. There was no history of renal or rheumatic affection in the family. Orthostatic albuminuria was present. There was very marked pulsation in the abdominal aorta and the iliac arteries. The right kidney was enlarged, movable, and tender, being easily grasped by the two hands, and passing one and a half inches below the costal margin. Compression of the right kidney elicited pain, which the patient stated was the same as she had experienced in the attacks referred to. This pain had occurred when she was walking or running, never when she was lying down. The left kidney was not felt.

Case XV.—R. S., female, aged eleven years, was seen in December, 1901. She was suffering from general debility, tiredness, headaches, and, as her previous health had been exceptionally good, the parents thought there must be some serious condition present to cause such a marked change. She was a bright, healthy looking, and well-nourished child. Orthostatic albuminuria was determined without any evidence of organic renal disease. Both kidneys were palpable and extremely movable; they could be definitely fixed below the ribs with the hand pushed in above them, and moved upward as easily above the lower costal margin. This range of mobility varied greatly from day to day, and sometimes it was the right kidney, sometimes the left which was

the more movable. After running up and down stairs the kidneys were both very movable, and this condition persisted unchanged after twelve hours' rest in bed. When, however, the abdomen was firmly bandaged during the time she was up, the kidneys appeared afterward to be distinctly less mobile and less palpable. Pulsation in the abdominal aorta was extremely well marked. The abdominal wall was soft, but there was no evidence of general enteroptosis. Firm bandaging of the abdomen was thought to produce a diminution in the amount of albumin, but not its disappearance.

Summary of Cases. Total number of author's cases of orthostatic albuminuria in adolescence, 40; of these 10 were males and 30 were females. Total number of the above cases with movable kidney, 15, or 37.5 per cent.; of these 2 were males and 13 were females. Of these 15 cases, in 5 both kidneys were movable; in 10 the right kidney alone was movable; in none was the left kidney alone movable. In 9 there was abnormal pulsation of the abdominal aorta. In 10 cases abdominal pain was present: (1) referred to the right or left hypochondrium in 4 cases; (2) referred to the umbilical region in 1 case; (3) generalized in 2 cases; (4) taking the form of acute gastric crises, with vomiting, etc., in 3 cases.

The average age of these patients when first seen was ten and a half years, the youngest being seven and the oldest fourteen years.

These are the clinical data from which I have been led to infer that there is more than an accidental association between orthostatic albuminuria and movable kidney. In adult life the only affection in which I have found pure orthostatic albuminuria to be present is Graves' disease. Among the abdominal signs of Graves' disease abnormal pulsation of the aorta and movable kidney are frequently observed, and orthostatic albuminuria may be combined with these. I have notes of several examples of this association, but have omitted them from the above list, which is limited strictly to the period of early adolescence. The association of these three conditions during late childhood and early adolescence is the more striking, because, although statistics show that orthostatic albuminuria occurs most frequently at that period of life, a condition of movable kidney is very rarely met with.

As a matter of personal experience, I may mention that I have met with more cases of movable kidney among forty cases of orthostatic albuminuria than among all the other patients examined at a children's hospital during a service of fifteen years. In the above cases the renal mobility was not part of a general enteroptosis, for in only one was there specially noted an extremely flaccid state of the abdominal walls. As a rule, the muscular wall of the abdomen was extremely strong and firm, as it usually is in childhood. One has, therefore, to look for some other cause of the renal mobility. The

question as to whether the normal kidney can or cannot be palpated through a normal abdominal wall would be differently answered by different authorities. In the above cases the term movable kidney is taken as implying that the kidney was moving, movable, and palpable. By moving, it is meant that during respiration there was a range of movement which was far beyond the physiological limit, and showed that the kidney had become a loose abdominal organ. By movable, it is meant that with the hand or hands the kidney could be pushed about in various directions, and, as a rule, most easily pushed upward under the ribs. By palpable, it is meant that the kidney could be grasped between the hands, one being placed in front of and the other behind the abdomen, and could be outlined in whole or in part by the compressing fingers. Such movable kidneys are detected on examination because they are also displaced, and are frequently rotated. This dislocation of the kidney is maintained even when the patient assumes the recumbent position, which is the only one in which a proper examination can be made. Sometimes the kidney sinks back into its normal situation after a longer or shorter period of recumbency, and in such a case its detection may be rendered difficult or impossible. The determination of enlargement of the kidney in addition to mobility is difficult, especially with firm abdominal walls of unknown thickness; but my own impression is that in some cases the kidney was decidedly enlarged, and in others it was not. Another point noted in connection with these cases was the ease with which the mobility of the kidney might be overlooked. At one time it was easily palpable, at another it was not so easily felt, while at a third it might not be felt at all. Thus, many of my earlier cases were under observation for some years without the condition being discovered, simply because repeated examination of the kidneys was not made. Rest in bed for a day or two seemed to lead to the disappearance of the kidney, as far as could be made out by manual examination. I have not been able to determine that the disappearance of albuminuria, which always follows rest in the recumbent posture, is necessarily accompanied by lessened mobility or size of the kidney, and in some cases this certainly did not take place.

The occurrence of attacks of abdominal pain was noted in ten of these cases. The onset of pain usually occurred when the patients were running or walking, and not when they were in bed, and relief followed the adoption of the recumbent posture, after a longer or shorter interval. When the patients were kept in bed entirely under careful supervision it was extremely rare to hear any complaint of abdominal pain, and when present it was invariably traceable to some cause apart from the kidney, usually to constipation. In some cases the pain was severe and accompanied by nausea, vomiting, and faint-

ing, so that the attack resembled closely a "renal crisis" such as is commonly associated with movable kidney. In others the pain was less severe, and was described as a dull aching in one or other hypochondrium, or about the umbilicus. In a third class there was generalized abdominal pain, and while sometimes this was evidently associated with fecal accumulation in the large bowel, at other times such a condition was not present, and the kidney was apparently primarily responsible. Compression of the kidney between the two hands would sometimes produce the same pain as that which had been previously complained of. There was no evidence in any of these patients of the existence of hydronephrosis. It is well to remember that persistent pain in one or other hypochondrium or about the umbilicus, as well as sudden attacks of pain in these regions, may be due, even in the case of children, to movable kidney, and the discovery of such a condition may clear up a difficulty in diagnosis.

As there is at present no complete agreement, perhaps one should say no definite knowledge, as to the etiology and pathology of orthostatic albuminuria or of movable kidney, an explanation of the above facts must be tendered with considerable reserve. As already stated, it is wiser to regard orthostatic albuminuria as a symptom and not as a disease, and the same remark applies to movable kidney. In orthostatic albuminuria there is a general vasomotor instability, as evidenced by the phenomena present in other parts of the body. The vascular tone is lowered and venous stasis is apt to occur. In healthy persons the altered state of the circulation on changing from the recumbent to the erect posture is promptly regulated by the normally acting vasomotor centres and nerves. In others, the subjects of orthostatic albuminuria, the vasomotor centres and nerves are not working normally, and they fail to act promptly under the changed conditions, with the result that venous stasis occurs in the kidneys. This temporarily alters the nutrition of the glomerular epithelium, and albumin transudes. The above represents what may be called the prevailing views as to the conditions present in the production of orthostatic albuminuria.

Following up this line of thought, we may suggest that at the same time the kidneys are surcharged with blood, and, therefore, heavier than under normal conditions. For the production of mobility of the kidney, apart from traumatism, we must assume one of two things, either that the supporting tissues are weakened or that the weight of the kidney is increased. Under a change of position, as from the recumbent to the erect posture, the effect of one or other of these factors will be a descent of the kidney from the normal situation. There was no evidence in the above cases, as already stated, that any weakening of the supporting tissues was present, and we therefore fall

back on the second alternative. The daily surcharging of the kidneys with venous blood when the patient assumes the erect posture, and the increased weight which follows, may in time tell on the renal supports and induce a certain progressive degree of mobility.

The third feature in these cases which has been referred to, namely, the abnormal pulsation of the abdominal aorta, is another evidence of lowered vascular tone, and a similar pulsation is probably present in the renal arteries. As an illustration, one might refer to the condition of the thyroid gland in Graves' disease, with its pulsating arteries, its tissues surcharged with blood, its weight increased, and its secretion altered. Nor is this simply an illustration, for in Graves' disease, if the cardiovascular disturbances are well marked, it will be found that movable kidney and abnormal pulsation to the abdominal aorta are usually present, and that orthostatic albuminuria is not uncommon.

The subject of orthostatic albuminuria has not received much attention in England within recent years, and I have not been able to find any references to its association with movable kidney. In French medical circles orthostatic albuminuria has been a good deal discussed. In 1900 Dr. Bourcy[1] recorded two cases and stated regarding one of them, a youth, aged nineteen years, that physical examination showed nothing abnormal, save a very pronounced mobility of the right kidney, which was neither painful nor enlarged. He mentions this fact without further comment, but it seems to have attracted the notice of Dr. Niviere,[2] who in 1901 published the case of a young man, aged twenty years, with orthostatic albuminuria and mobility of the right kidney. He ordered a flannel belt to be worn, and under this treatment the albuminuria disappeared, save when the belt became slack or failed to support the abdominal wall. He concludes that in this case a stasis of blood in the kidney was due to the renal mobility; but that for the production of the albuminuria in the erect posture there must also have been some special sensitiveness in the kidney, probably as the result of scarlet fever in early life. This case is extremely interesting, but it might prove misleading if an impression got abroad—for which the author would not be responsible—that orthostatic albuminuria with movable kidney can be cured by the application of an abdominal belt. Even in Dr. Niviere's case the patient was examined only on some seven occasions during a period of eight months, and thus the test was far from being conclusive in an affection so variable in its occurrence as orthostatic albuminuria. Before the appearance of this paper I had frequently tried the effect of tightly bandaging the abdomen before the patient rose from bed, but had failed to pro-

[1] Bull. et Mém. des Hôp. de Paris, 1900, No. 21.

[2] Ibid., 1901, No. 6, p. 148.

duce any marked result. I have repeated these trials since, the abdomen being tightly bound with surgical strapping, and above that an elastic bandage. In some of the cases the albumin did not always appear after the patient rose from bed, as will happen quite apart from any bandaging in such cases, but in none did a complete cessation of the albuminuria take place on repeated trials. It is evident that no patient could tolerate for a day the amount of pressure necessary to secure absolute fixation of the kidney. From my own experience I do not think that the result obtained by Dr. Niviere will be often reproduced in other cases. The question as to how far, if at all, the mobility of the kidney affects the occurrence of the albuminuria in these cases might be definitely settled if a patient were surgically treated by fixation of the kidney to the abdominal wall. In none of my own patients has there been the slightest indication for such treatment. In the mild as well as in the more severe cases the application of a broad, firm bandage of flannel around the abdomen is undoubtedly beneficial, both as regards the albuminuria and the symptoms associated with movable kidney. It is best applied outside a combination undergarment, to which it can be pinned so as to prevent upward or downward displacement. With this protection the child's natural romping and running may continue without risk of harm; but any severe or prolonged muscular exercise, or fatigue from any cause, is to be carefully avoided. In addition to these local measures it is necessary to supervise carefully the dietary, the amount of school work, the recreations, and the home surroundings, for the patients are of unstable nervous equilibrium, and are at a developmental period when much and permanent harm may accrue if the individual requirements are not carefully studied and treated.

COLD AS A CAUSAL FACTOR IN THE BLOOD CHANGES DUE TO HIGH ALTITUDE.

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In an earlier paper[1] the writer called attention to the fact that the increased counts of red corpuscles in the blood due to high altitude are temporary, contrary to the generally accepted opinion that the blood counts in high altitudes are practically normal or at most only slightly above. At least such is the case for the moderately high altitude of five thousand feet.

Up to the present time no satisfactory explanation for these altitude changes has been offered. The more commonly accepted theory is,

[1] Bulletin Hadley Climatological Laboratory, vol. iii., No. 3.

that it is due to diminished atmospheric pressure, or that a greater number of red cells is required to furnish sufficient oxygen to the tissues under the diminished oxygen supply of high altitudes. While this appears quite plausible at first thought, it must be admitted that serious difficulties stand in the way of its acceptance. In the first place, the oxygen absorption by the red cells is a chemical phenomenon, and as such is independent of the partial pressure of oxygen save at extreme limits. Secondly, the partial pressure of oxygen in the air cells of the lungs differs from that in the external air, and as yet we have no data to show that the two vary directly. Thirdly, it is not at all plain why an increased number of red cells should be required to carry a given amount of oxygen, for, as Paul Bert has shown, the amount of oxygen actually used by an animal is constant, even when the supply is diminished by one-half, or when the animal respires pure oxygen. Fourthly, this theory cannot account for the fact which I believe has been proved, that the increase in red cells due to altitude is only temporary. And if it is objected that lung expansion neutralizes the necessity for the increased number of red cells, it may be said that the two changes did not occur together in some cases that I have observed.

In addition to the above a number of other hypotheses have been offered, of which the following may be mentioned:

1. The blood is concentrated by loss of moisture from the body due to dryness of mountain climates. This produces an increase in the number of blood cells per cubic millimetre, though the total number of cells in the body remains practically constant, that is, the increase is only apparent.

2. Another hypothesis states that the cells are actually increased in numbers but reduced in size, their total volume remaining constant.

Before discussing farther these statements, the writer's work may be advantageously presented. The work was undertaken very largely to test these hypotheses. To this end an elaborate experiment was planned as follows: Three healthy, male, common white rabbits, which were full grown, were taken from the laboratory pen for the experiment. Care was observed that the feed was not changed during this time. The following factors were determined at the beginning of the experiment, again before the animals were sent to the mountains at an increased altitude of two thousand feet, and also immediately upon their return. The factors are: weight, specific gravity of the blood, percentage of hæmoglobin, volume of red corpuscles as determined by the hematokrit, diameter of the red cells, and the number of red and white cells per cubic millimetre, respectively. Care was taken to keep a constant method throughout the experiment. This, however, was not possible in the case of the hematokrit tests, as an accident rendered necessary the employment of two different machines during the work.

TABLE I.—BLOOD COUNTS OF RABBITS KEPT IN COLD AND LATER SENT TO A HIGHER ALTITUDE, BUT AT APPROXIMATELY THE SAME TEMPERATURE. PART 1.

Examination No.	Date.	Hour.	Place.	Altitude in feet.	Time in mountains.	Weight	Sp. gr.	Hæmaglobin.	Cell volume	Cell diam.	No. of red cells.	No. of white cells.	Increase in red cells.	Remarks.
	1901.					Rabbit No. 8. Old male, in good condition.								
1	Feb. 19	11.00 A.	Albuquerque	5000	.....	6 lbs.	1058	.....	44 %	6.36 μ	6,290,000	17,000	.....	Kept in warm basement.
2	Mar. 25	3.30 P.	"	5000	See remarks	6 "	1060	75 %	49 %	6.52 "	6,730,000	7,500	+440,000	In cold 27 days.
3	Apr. 12	3.00 P.	Camp Whitcomb	7000	14 days	6 "	1060	75 %	46 %	6.38 "	6,658,000	10,000	−72,000	Exam. at Albuquerque.
	1901.					Rabbit No. 10. Male, about one year old, in good condition.								
1	Feb. 28	.....	Albuquerque	5000	.....	4 lbs.	1060	.....	38 %	6.1 μ	5,658,000	10,000	.....	Kept in warm basement.
2	Mar. 26	2.45 P.	"	5000	See remarks	4½ "	1062	82 %	54 %	6.55 "	7,720,000	6,600	+2,062,000	In cold 26 days.
3	Apr. 13	10.45 A.	Camp Whitcomb	7000	14 days	4½ "	1060	80 %	47 %	6.48 "	6,290,000	10,700	−1,430,000	Exam. at Albuquerque.
	1901.					Rabbit No. 12. Male, about one year old, fat.								
1	Feb. 28	3.00 P.	Albuquerque	5000	.....	6½ lbs.	1059	.....	.....	5.96 μ	6,564,000	7,000	.....	Kept in warm basement.
2	Mar. 28	2.00 P.	"	5000	See remarks	6 "	1060	83 %	52 %	6.55 "	6,689,000	9,000	+125,000	In cold 24 days.
3	Apr. 13	3.30 P.	Camp Whitcomb	7000	14 days	6 "	1059	82 %	47 %	6.9 "	5,884,000	13,000	−805,000	Exam. at Albuquerque.
						PART 2.								
	1901.					Rabbit No. 13. Female, full grown; had young about ten weeks old.								
1	Apr. 19	3.30 P.	Albuquerque	5000	.....	4¾ lbs.	1052	70 %	39 %	.....	5,449,000	.....	.....	Out-doors in cold 3 days.
2	May 3	3.15 P.	"	5000	See remarks	5 "	1058	76 %	43 %	.....	6,911,000	.....	+1,462,000	" " 17 "
3	May 17	4.00 P.	Camp Whitcomb	7000	13 days	5 "	1060	77 %	46 %	.....	6,302,000	.....	−609,000	In from mount. to-day.
	1901.					Rabbit No. 14. Female, full grown; had young about fourteen weeks previous to experiment.								
1	Apr. 18	3.30 P.	Albuquerque	5000	.....	5¼ lbs.	1058	80 %	51 %	.....	6,773,000	.....	.....	Out-doors in cold 2 days.
2	May 3	10.45 A.	"	5000	.....	5½ "	1058	72 %	44 %	.....	5,404,000	.....	−1,369,000	" " 17 "
3	May 17	8.10 A.	Camp Whitcomb	7000	13 days	5½ "	1058	80 %	45 %	.....	6,795,000	.....	+1,391,000	In from mount to-day.
	1901.					Rabbit No. 15. Female, young, about fourteen weeks old.								
1	May 2	2.30 P.	Albuquerque	5000	.....	3¾ lbs.	1062	90 %	49 %	.....	7,368,000	.....	.....	Out-doors in cold 16 dys.
2	May 18	9.00 A.	Camp Whitcomb	7000	13 days	3¾ "	1062	87 %	50 %	.....	7,297,000	.....	−71,000	In from mount. one day.

The experiment being undertaken during the cold weather of the month of February, as a further precaution and in order to make conditions as nearly uniform as possible, the animals were removed from the relatively warm basement of the laboratory to the open air, where they were exposed to approximately the same conditions as in the mountains. The full data of the three examinations are given in the preceding table.

Two striking facts are revealed in this experiment. 1. The animals in passing from the warm basement to the colder temperature outside underwent the usual phenomena of high altitude changes, viz., increased specific gravity of the blood, increased volume of red cells, and increased number of red cells. 2. When the animals were sent to the mountains, no further increase took place in these factors.

These results were so unusual and unexpected that a repetition of the experiment seemed desirable. It was therefore repeated but under less favorable conditions. Male rabbits not being available, three females were used, two of which had had young ten and fourteen weeks previously, and the third was a growing rabbit. Then, too, owing to the warmer weather of April, the temperature change was not so marked. These circumstances, together with the fact that females are not favorable subjects for experiment generally, rendered this test somewhat uncertain. The data are embraced in Table I., Part 2.

Rabbit No. 13 conforms most closely to the results previously obtained, showing a marked increase in the various factors on being placed in the cold, and without a subsequent increase in the cell count on going to the higher altitude.

Rabbit No. 14 appears to violate the law, inasmuch as a decrease is shown in the various factors on being placed in the cold. However, no increase over the first results is shown when the animal was taken to the higher altitude. This animal was probably an abnormal subject.

Rabbit No. 15 was not examined before being placed in the cold, but the subsequent changes conform to the rule, the various factors showing no further increase in the higher altitude.

In general, therefore, the experiment confirms the results of the first.

That cold produces higher blood counts is shown by the higher counts of the winter season over those of summer. In this connection a number of summer and winter counts, taken from the same individuals, are of interest. I have only thirteen cases which fall under this head, but the results are striking and are tabulated as follows:

TABLE II.—COMPARATIVE BLOOD COUNTS IN SUMMER AND WINTER SEASONS.

Case No.	Sex.	Age.	Condition.	Summer.				Winter.				
				Date.	Hour.	Sp. gr.	Red cells.	Date.	Hour.	Sp. gr.	Red cells.	Increase in winter.
27	Male	Adult	Tuberculous; recovered	Aug. 5, 1900	11.00 A.M.	.....	4,737,000	Dec. 19, 1900	10.45 A.M.	1060	5,351,000	614,000
34	Male	28	Tuberculous; recovered	Aug. 4, "	6.15 P.M.	1055	3,640,000	Jan. 22, 1901	11.00 A.M.	1058	5,640,000	2,000,000
21	Male	Adult	Tuberculous	June 20, "	9.30 A.M.	.....	6,242,000	Jan. 24, "	12.15 P.M.	1061	5,738,000	—504,000
28	Male	25	Tuberculous	Aug. 1, "	2.45 P.M.	1060	5,081,000	Jan. 28, "	2.30 P.M.	1062	5,413,000	382,000
22	Male	41	Tuberculous	July 18, "	9.30 A.M.	.....	5,737,000	Jan. 30, "	10.40 A.M.	1059	6,200,000	463,000
32	Female	22	Pneumonia; recovered .	Aug. 3, "	11.40 A.M.	1057	5,711,000	Feb. 2, "	11.00 A.M.	1059	5,920,000	209,000
31	Female	22	Tuberculous; recovered	Aug. 3, "	9.30 A.M.	.....	3,422,000	Feb. 2, "	11.15 A.M.	1058	5,035,000	1,613,000
10	Male	Adult	Tuberculous	May 11, "	10.15 A.M.	.....	6,072,000	Feb. 4, "	3.45 P.M.	1058	5,980,000	—92,000
6	Male	22	Normal	May 23. "	2.00 P.M.	.....	5,000,000	Feb. 13, "	11.00 A.M.	1062	5,431,000	431,000
33	Female	27	Tuberculous; recovered	Aug 3, "	4.30 P.M.	1055	4,147,000	Feb. 23, "	2.30 P.M.	1060	4,844,000	697,000
24	Male	15	Normal	July 20, "	12.00 M.	.....	5,404,000	Mar. 3, "	3.15 P.M.	1062	5,493,000	89,000
38	Male	15	Normal	Aug. 25, "	10.00 A.M.	.....	4,764,000	Mar. 7, "	2.20 P.M.	.....	5,162,000	398,000
20_a	Female	Adult	Tuberculous; recovered	July 19, "	11.00 A.M.	... ..	4,822,000	Mar. 21, "	3.30 P.M.	1058	4,835,000	13,000
											Average	485,000

From the foregoing it is seen that eleven of the thirteen cases show higher winter counts. The two cases showing lower winter counts are tuberculous subjects, while two other tuberculous subjects conform to the general rule. Taking all the cases, the average of the winter counts over those of summer is 485,000 cells.

If we observe the specific gravities we again find higher figures for the winter season. Unfortunately, only four determinations were taken in both seasons; but these four all show an increase in winter, the average being three points higher. Results similar to the above have been obtained by other investigators.

It appears quite remarkable that the above facts have never been applied in explaining the altitude phenomena as exhibited in blood changes. Yet it is true that the temperature change in passing from a lower to a higher altitude is usually quite marked. If the cold of winter produces higher blood counts, then it is only reasonable to expect that the cooler temperature of higher altitudes should also produce higher counts. The foregoing animal experiments which show an increased count when the animals were taken from a warm to a cold temperature, and which showed no material increase when subsequently taken to a higher altitude, but at approximately the same temperature,[1] would seem to lend material strength to the theory that cold is an important causal factor in the blood changes due to high altitude.

Regarding the ultimate question as to whether the increase in red cells is due to physical or physiological causes, or, in other words, whether the increase is apparent (being due to blood concentration) or real, the writer is not prepared to say from the data at hand. My opinion is that it is probably due to both factors. And why not? It is generally conceded that the blood is denser in winter than in summer—a fact supported by our experiments. This should increase the cell count and the other factors as well. It is also a fact that general nutrition is improved in cold weather, as is shown by a gain in body weight. *A priori* the blood should participate in this general well-being by an absolute increased number of red corpuscles.

Without further discussion of the several factors determined in these experiments, the following conclusions seem warranted:

1. Cold is an important factor in accounting for the blood changes due to high altitude. That cold is the only factor, however, is not maintained.

2. In general the specific gravity, the hæmoglobin, and the volume of cells follow the increase or decrease of the red blood cells, although this is not invariably the case.

[1] It may be stated that Captain Whitcomb claims a warmer temperature for the camp than for Albuquerque. This is accounted for by the fact that the camp is located in a cañon sheltered from the cold winds.

3. Although the data are too few for a final conclusion, there is no evidence that a decrease in the size of the cells accompanies an increased cell count. The contrary, however, is indicated, and this factor probably varies directly with the others.

OBSERVATIONS ON A CASE OF DIABETES TERMINATING IN COMA.[1]

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and

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of New York City.

The excretion of organic acids in cases of severe diabetes has been extensively studied by Stadelman, Naunyn, Minkowski, and Magnus-Levy in Germany, and by Herter and Joslin in this country. These observers have emphasized the fact that diabetic coma is regularly attended by a considerable degree of acid intoxication. They have also shown that the degree of acidosis is of far greater prognostic value than the amount of sugar excreted. It has been found that in diabetes, β-oxybutyric acid and diacetic acid are prominent among the organic acids formed and eliminated, and also that the amount of ammonia in the urine is a rough index of the amount of organic acids thrown from the system. The source of these organic acids is still under debate. Some believe them to be due to an excessive proteid cleavage; others consider them intermediate products in the metabolism of fat. It has not been satisfactorily proved that they do not come from carbohydrate.

These facts and theories are of great practical importance in the therapeutics of diabetes, both in regard to the character of the diet and, also, to the possibility of neutralizing the condition of acidosis by the administration of alkalies. Since the accumulation of evidence is the only method by which the validity of the theories in this connection can be substantiated or refuted, we have thought it worth while to place on record the facts we were able to obtain from a case which has recently come under our observation.

The history of the case is as follows:

J. F., born in New York. When first seen he was twelve years of age, was attending school and advancing well in his studies. His father and mother, a brother, and two sisters younger than J. F., are all living, well and strong. None of his family has had any serious illness. J. F. was delivered at eight months and instruments were used, for what reason could not be ascertained. He was a very delicate child up to three years of age, but from this period seems to have been a

[1] Read before the New York Society of Internal Medicine, March 18, 1903.

strong boy. At six years of age he had whooping-cough and measles, which passed away leaving no known sequelæ. Up to the beginning of his present illness he was considered well and strong. Six months before he presented himself at the clinic he received a severe blow on the back of the head from a baseball. He fell down, but was not unconscious and no importance was attached to the injury. A severe bruise resulted. Up to the time he was first seen by us, J. F. attended school regularly and indulged freely in outdoor sports, in which he was proficient.

About the middle of November, 1901, his mother noticed that he had a tremendous appetite, and soon afterward that he was excessively thirsty, drinking a large amount of water and passing a great quantity of urine. The amount of urine continually increased, until he was obliged to get up several times each night to empty his bladder. About December 1st he began to have pains in the calves of his legs. His bowels were constipated.

On December 31, 1901, he came to the Vanderbilt Clinic for treatment. At that time he was on an unrestricted diet and passed about 6 litres of urine in twenty-four hours, of a specific gravity of 1040, and containing 480 grammes of sugar; also diacetic acid and a trace of albumin.

He was a well-nourished boy, weighing 81¼ pounds, and the physical examination revealed nothing abnormal except a rough, harsh skin.

He was advised to give up carbohydrate food and to continue his visits to the clinic. On January 24, 1902, he passed 4000 c.c. of urine, of a specific gravity of 1033, containing 280 grammes of sugar and a trace of albumin. The amount of diacetic acid noted by Gerhardt's test did not seem to have changed.

On January 24th the patient was induced to enter the Roosevelt Hospital in the service of Professor Walter James, to whose courtesy we are indebted for the privilege of studying the case while in the hospital. He was under observation there for something over a month. The more important data which we were able to collect at that time are shown in the annexed table. During his stay in the hospital the patient was often drowsy, and continually complained of a slight pain in his lower extremities.

When his parents, much to our regret, insisted upon taking him home, his general condition did not appear to have materially altered, except that he had lost about five pounds in weight.

He continued to return to the clinic once a week and seemed as strong as ever. He was able to play ball and enjoy himself in outdoor sports. On March 23d he weighed 83 pounds, and the condition of his urine had not materially changed. We last saw him on May 2d, when he weighed 78¼ pounds and seemed to be in as good condition as at any time during his illness. He passed on that day 2880 c.c. of urine, of a specific gravity of 1035, and containing 201 grammes of sugar, traces of albumin and diacetic acid.

He died on May 9th, after being in coma for eighteen hours. We were not aware of his death until four days later.

During the period after he left the hospital he was on a diet from which the carbohydrates were supposed to have been excluded. He was given a pint of cream a day and 10 grammes of bicarbonate of soda in each twenty-four hours.

The Period during Which the Patient was Under Observation in the Hospital. It was our intention to study our patient's condition and his metabolism under the influence of different diets and the administration of various drugs. On admission to the hospital he was allowed a full diet, consisting of carbohydrates, proteids, and fats. At the end of a week, at which time it may be supposed he was fully under the influence of the diet, his urine was analyzed, with the result shown in part in the table. On February 1st his diet was made to consist of meat, eggs, gluten bread, and cream and water in equal parts. This diet was continued through the remainder of the period. From February 1st to February 12th he suffered from a slight tonsillitis, but was practically free from fever. On February 14th he was given aspirin, 0.3 grammes three times a day, for the pain in the legs, which it relieved; this was stopped on Febraury 18th. From February 19th to the end of the period, 10 grammes of bicarbonate of soda were given in each twenty-four hours.

TABLE OF ANALYTICAL RESULTS AND OTHER DATA.

Date.	Urine.												Patient.		
1902	Total volume (c.c.).	Specific gravity.	Acetone (gram.).	Diacetic acid.	Rotation.	Roration after fermentation.	Sugar (grams.).	Total nitrogen (grams.).	Nitrogen of ammonia (grams.).	Ratio of N of NH_3 to total N.	Per ct. of "N of NH_3" of total N.	Weight (pounds).	Character of diet.	Drugs given.
Jan. 30	3726	1.0365	+	+	+8.3°	−0.1°	290	16.47	1.16	1 : 14	7%	76½	Unrestricted.	0
" 31	2958	1.0383	+	+	+8.3	0.0	233	16.50	1.13	1 : 15	7%			
Feb. 5	1715	1.0330	+	+	+4.1	−1.2	123	18.65	3.24	1 : 5	20%	73½	Restricted.	0
" 6	2455	1.0349	+	+	+6.7	−0.8	184	17.09	2.92	1 : 6	17%			
" 12	2601	1.0325	0.292	+	+6.0	−1.0	181	13.97	3.10	1 : 4	25%	73¼	"	0
" 13	2010	1.0344	0.228	+	+6.1	−0.7	143	15.80	3.43	1 : 5	20%			
" 17	5323	1.0245	0.917	+	+7.1	−0.9	422	21.10	4.01	1 : 5	20%	75½	"	Aspirin 0.3 gm. t. i. d.
" 22	5090	1.0335	0.962	+	+6.8	−0.4	351	22.58	3.27	1 : 7	14%	76	"	Sod. bicarb. 10 gms. each 24 hrs.

The chemical work was done in the laboratory of physiological chemistry of Columbia University, at the College of Physicians and Surgeons.

Analyses of the urine were made daily from January 29th to February 28th. The above abbreviated summary shows clearly the fluctuations in the amounts of the various constituents. The methods of analysis were those now commonly employed.

The figures for acetone on February 17th and 22d are rather high. We attribute the rise in part to the fact that the urines of both days

had fermented slightly. The alcohol formed in the process unavoidably affected the results.

We are indebted to Dr. Wm. A. Taltavall for all of the gravimetric determinations of acetone.

From a review of the analytical data in the accompanying table the following points connected with the urine may be emphasized:

β-oxybutyric acid, as indicated by lævorotation after complete fermentation of the sugar, was present throughout. The observed lævorotation was not due to albumin.

Acetone and diacetic acid were also always detected.

The amount of sugar was at first diminished under the restricted diet, but later rose to its highest point, although the patient was continued on the same diet. This result may have been connected with the administration of aspirin (acetylsalicylic acid). A point seemingly in harmony with this conclusion is the fact that at this time there was also a considerable increase of the nitrogen output—an occurrence indicating a greater nitrogenous catabolism. This result as a specific influence of salicylic compounds has been established by the investigations of Kumagawa and others.

A point of particular interest to be observed from the tabulated data is the marked increase of N of NH_3 when the patient's diet was restricted. Normally a man should eliminate not over 2 grammes of N of NH_3 in twenty-four hours. In our patient, however, at one time the amount reached was over 4 grammes a day. The advocates of the acid-intoxication theory would claim that the increase was necessitated for the neutralization of the large amount of organic acid which failed of normal oxidation. According to Herter, 4 grammes of NH_3 would correspond to an output of approximately 16 grammes of β-oxybutyric acid. Later, as will be seen in the table, the administration of bicarbonate of soda, by neutralizing a certain amount of the unoxidized organic acid, made the demand for NH_3 less, and the amount excreted was decreased somewhat.

In a corresponding manner the changing ratio of N of NH_3 to the total nitrogen (to be seen in the table) would argue for an increasing condition of acidosis. Normally the N of NH_3 does not exceed 7 per cent. of the total nitrogen; when it reaches 20 or 25 per cent., as it did in our case, a grave condition of acid intoxication may be inferred.

It would seem in this case, judging from the nitrogen ratio, that the restricted diet had something to do with the increased excretion of acids. Such a result has been explained by previous observers on the ground that a certain amount of carbohydrate is necessary in the diet to insure the complete oxidation of these acids, and that the acids are produced from the fats (Magnus-Levy). On the other hand, Herter believes that the organic acids are the result of excessive proteid metab-

olism, and claims that most of his severe cases show a diminution in the excretion of organic acids when the patients are put on a diet containing the minimum amount of carbohydrate food.

That there was no correspondence in the amounts of sugar and organic acid in this case is indicated very clearly in the table.

We are hardly justified in drawing general conclusions from the data of a single case under observation for so short a period. We are certainly impressed, however, by the fact that the determination of the "nitrogen ratio" in severe cases of diabetes furnishes data of great prognostic value. Further, it would seem that diet, in certain cases at least, may not be restricted with impunity in carbohydrates, while it is quite possible that a restriction of the fats and a continuation of carbohydrates may be of advantage. On the acid-intoxication theory, the administration of alkalies affords a rational, if not an absolutely proved, means of combating the results of diabetic metabolism.

References.

Stadelman. Ueber den Einfluss der Alkalien. Stuttgart, 1890. Arch. f. Exp. Path. u. Pharm., 1883, Bd. xvii. Archiv f. klin. Med., 1886, Bd. xxxviii. p. 302.

Naunyn. Volkmann's Sammlung klin. Vorträg, 1889, Nos. 249-350. Der Diabetes. Die Deutsche Klinik., Berlin, 1901, Bd. iii. p. 15.

Minkowski. Arch. f. exp. Path. u. Pharm., 1884, Bd. xviii. S. 35.

Magnus-Levy. Arch. f. exp. Path. u. Pharm., 1899, Bd. xlii. S. 149. Ibid., 1901, Bd. xlv. S. 389.

Kumagawa. Virchow's Archiv, 1888, Bd. cxiii.

Herter. Trans. Assoc. Amer. Phys., 1900, vol. xv., and 1901, vol. xvi. Lectures on Chemical Pathology, New York, 1902.

Joslin. Trans. Assoc. Amer. Phys., 1901, vol. xvi. p. 612.

A CASE OF DIAPHRAGMATIC HERNIA; DEATH FROM ACUTE DISTENTION.

By T. L. Chadbourne, M.D.,
of Gallipolis, Ohio.

(From the Pathological Laboratory of the Ohio Hospital for Epileptics.)

On July 23, 1902, E. L., an inmate of the Ohio Hospital for Epileptics, died rather suddenly with a syndrome of symptoms, consisting of pain in the stomach region, dyspnœa, and abdominal distention. The patient's illness dated only from the previous day. Soon after a dinner consisting for the most part of vegetables and unripe fruit he became qualmish and vomited; after this he was noticeably short of breath and complained of pain in the abdomen. For this deodorized tincture of opium was given in water, which he had no difficulty in retaining, as there was no further vomiting. He remained sitting or lying on a cot until eight o'clock in the evening, when he was able to walk a short dis-

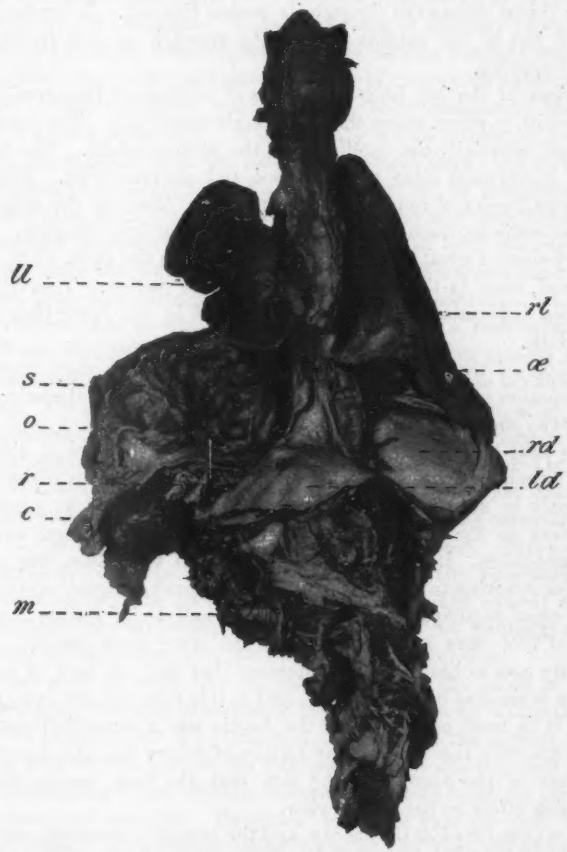
tance to the hospital ward, and afterward to the water-closet, where his bowels moved once. He was then put to bed, and, still complaining of pain in the belly, was given one-fourth of a grain of morphine hypodermically. The abdomen was still greatly distended. Following the injection the patient slept rather unquietly until five o'clock in the morning. He died in about an hour after this with a continuance of the symptoms already noted.

The patient was a male, thirty years of age, an epileptic, with a marked infantile paralysis of the whole left side, with contractures of the hand. The palsy and the grand mal seizures to which he was subject dated from an attack of meningitis in the eighteenth month. He is said to have been a normal and healthy infant, and, aside from his epilepsy and palsy, as a rule to have been well throughout his life. He was always a voracious eater, but never had any vomiting attacks. His relatives do not recall that he ever complained of his chest, and no suspicion of there being anything unusual in this region was ever entertained. During the patient's residence in the hospital of about a year he was always well and cheerful, although his simple mental condition and his lameness quite incapacitated him.

The necropsy was performed July 23d, four hours post-mortem. There was enormous distention of the abdomen, which was everywhere tympanitic. There was marked soft œdema of the scrotum. Incision of the abdomen allowed the escape of a small amount of gas and a little slightly clouded fluid. The intestines were much blown up and greatly congested. When the sternum was removed the left side of the thorax was seen to be occupied to the level of the second rib by a part of the abdominal viscera. There was a large defect in the left half of the diaphragm, through which had passed the whole stomach, the omentum, and part of the large intestine beginning about three inches above the caput and including a portion of the descending colon. The caput coli, with the sound appendix, occupied the stomach region. About three inches above the ileocæcal valve there was a small adhesion, causing a kink in the bowel, which was, however, still patulous. The stomach was of normal color, but the large intestine was rather dark. No obstruction other than that possibly caused by the hernial ring could be found. The heart was displaced toward the right, so that its left border was in the right sternal line. This organ, opened in position, showed no change beyond a slight increase of the pericardial fluid. After allowing the escape of the gas the abdominal viscera could be replaced in the abdomen without much difficulty, as there were no adhesions about the ring, and they slipped through the large opening easily.

The accompanying photo-engraving, which shows the organs from behind, will serve to give an idea of the relations of these structures to each other and to the orifice in the diaphragm.

The following measurements, taken after the hardening in formalin, are of course only relative, but indicate the comparative sizes of the two lungs. The right one is 22 x 18 cm., the left 14½ x 8 cm. This latter



From a photograph. Upon the right are shown the right lung (*rl*) with the corresponding half of the diaphragm (*r d*) beneath it, and opposite, the compressed lung (*ll*). Above the left segment of the diaphragm (*l d*) lie the organs—stomach (*s*), omentum (*o*), and colon (*c*)—that have passed through the hernial ring. This orifice is not well shown, but the posterior part of its rim is indicated by the sharp line at *r*, just behind the cardiac end of the stomach. Lower down is the free border of the mesentery (*m*), the intestines having been removed. The cut end of the œsophagus is at *o e*.

organ lay close against the spine; it was much compressed, but both lobes contained some air. The left lung presents the following anomaly: A horizontal fissure, extending about two-thirds of the way to the root,

divides the lower lobe into two parts, the upper division being about one-half as large as the inferior. The opening in the diaphragm corresponds, roughly, to the position of the left tendinous leaflet, and measures about 8 x 12 cm. Its edges are quite firm and sclerotic. The œsophagus can be traced downward through its proper foramen. It bends sharply upward just at the cardiac end of the stomach to pass through the hernial opening.

Sections of the left lung show areas of collapse of the alveoli, alternating with portions where the lung is air-containing. The vessels are engorged, especially the capillaries of the alveolar walls. The bronchi in the compressed areas are collapsed and desquamating. There are a few small areas of round-celled infiltration. Many of the cells of the alveolar walls are vacuolated, and some of them desquamating. There is everywhere a great deal of brown pigment in the cells. The nuclei stain well, even in the densest regions of the section. This condition of brown induration is rather more marked in the lower than in the upper lobe.

Sections of the rather dark-looking large intestine show a striking desquamation of the epithelium and moderate œdema of the submucosa. The nuclei stain well.

It is said by Arnheim[1] that about four hundred cases of diaphragmatic hernia had been reported up to 1896. Similar conditions exist frequently in animals (Monnier[2]). As far as most of its anatomical characters go, the instance in hand conforms to the general rules for such anomalies. It was not a true hernia, in that there was no sac. Statistics referring to the side involved vary much, Duguet[3] claiming an almost equal participation of the two sides, and Deitz[4] stating that in a series of 282 cases analyzed by him 261 were upon the left. Most authority goes to bear out the statement that the left half of the diaphragm is the seat of predilection, and to this rule our case is no exception. It is most probable that the hernia was a congenital one, if we may judge from the lack of any history of injury and the hardness of the edges of the opening. The fact that the lung was in part air-containing offers no bar to this view.

The organs found in the thorax, and the stomach, omentum, and colon were those most often displaced, the usual order being stomach, colon, omentum, small intestine, spleen, liver, duodenum, cæcum, and kidney (Deitz).

While death was directly due to the hernia, as is usually the case (Lacher)[5], it is the particular mode of death that lends the chief interest to the present example. The subjects of congenital hernia through the diaphragm are likely to die early. Perhaps a majority of all cases is found in infants stillborn, or expiring within a few minutes of birth. Frequently there is so much interference with the respiration and such

flattening of the upper part of the abdomen as to arouse a suspicion of a malformation of the diaphragm.

Intercurrent affections are responsible for a percentage of fatal terminations, and pneumonia seems to be cited very frequently, as in the cases of Harris[6] and of Lawrence.[7] Like the victims of ordinary rupture, the subjects of congenital diaphragmatic hernia live in constant danger of strangulation, and to this accident the deaths of many such adult persons are due. After persistent vomiting, pain, and constipation they die usually in a week or ten days. Williamson[8] gives an instance of strangulation of the stomach when the patient lived eight days. As with ordinary hernias, those through the diaphragm seem to be proportionately more dangerous when the aperture is small. Maylard[9] and Annequin[10] cite cases that illustrate this point. Ord's[11] patient lived six days, and at autopsy there was found a piece of the splenic flexure and some of the omentum projecting through the left side of the diaphragm. Klingelhoefer[12] reports that he was once called at 8 P.M. to a man twenty-two years of age who had been ill since afternoon. A few months earlier the patient had had pneumonia, and lately had been prone to nausea and vomiting. On the day of the illness he ate a large dinner, after which he complained of pain and vomited. Examination of the chest revealed signs that led to a diagnosis of pneumothorax. Death occurred at seven o'clock the next morning. On opening the thorax the left half contained air, and the whole stomach, the spleen, most of the omentum, and 25 cm. of the colon. The lung was much compressed. There was a small perforation in the stomach, accounting for the pneumothorax. The author thought the opening in the diaphragm had existed a long time, and that the overloading of the stomach and the retching caused the passage of the organs into the thorax and strangulation.

It seems as if in cases like the one just quoted the cause of death might be open to another explanation than that given by Klingelhoefer. As Lacher suggests, it is not difficult to imagine that the sudden irruption of a considerable part of the abdominal organs into the chest might be so embarrassing to the thoracic viscera as to cause death, by paralysis of the heart, for example. Bergman[13] gives an example that brings out this point. This author, after pointing out that diaphragmatic hernia should always be considered among the possible causes of sudden death in apparently healthy persons, recites the following history: A man, twenty-three years of age, four months previously the recipient of a stab wound in the left side, was taken suddenly ill, after lifting, with symptoms of collapse—vomiting, etc.—and died the same night. No diagnosis was made. At the inquest, undertaken because of some suspicion of foul play, death was ascribed to the effects of the sudden entrance of a large part of the stomach into the thorax, in connection with a diseased condition of the heart.

Practically the same state of affairs might result from the sudden dilatation of organs like the stomach, habitually carried in the thorax and causing but little inconvenience in their ordinary condition. As Lacher puts it: "A sudden distention, either by gas or fluid, of any of the organs lying in the thoracic cavity may cause a sudden fatal termination, apparently from paralysis of the heart, resulting from the sudden pressure."

This supposition seems to offer the simplest explanation of the course of the short illness of our own patient. The sudden distention of the stomach and the large intestine within the thorax, aided by the upward thrust of the diaphragm from the inflation of the small intestines remaining in the abdomen, probably caused so much disturbance of the conditions in the thorax as to bring about the patient's death.

REFERENCES.

1. Dissertation, Giessen, 1896.
2. Paris Thesis, 1897.
3. Ref. P. T. Gauthier, Paris Thesis, 1897.
4. Gazette Méd. de Strasburg, 1884. Ref. Monnier.
5. Deutsches Archiv f. klin. Med., xxvii.
6. Medical Record, 1884.
7. London Lancet, 1852.
8. Military Surgery, 1863.
9. Glasgow Medical Journal, 1896.
10. Archiv. de Méd. et de Phar. Militaires, 1893.
11. London Lancet, 1887.
12. Berliner klin. Wochenschr., 1877.
13. Zeitschr. f. Medicinal Beamte, 1898.

A CASE OF MYCOSIS FUNGOIDES SYMPTOMATICALLY CURED BY MEANS OF X-RAYS.

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J. F. PAYNE, writing in Allbutt's *System*, says of mycosis fungoides: "The disease is probably always fatal." If, therefore, it can be proved that an undoubted case of this disease has yielded promptly and completely to the use of the X-rays, it constitutes a distinct step forward in our treatment of the condition and incidentally constitutes another victory for X-ray therapy.

From the pictures herewith presented and the description of the case about to be given, I take it that no one will doubt the diagnosis, and yet, should the identity of the disease be questioned, it must be admitted that the effect of the rays upon the growths has been truly remarkable.

For the guidance of workers in X-ray therapy I have been careful to give every step of the technique used and a detail of every treatment employed. This is especially necessary at this time, as there are a goodly number of men throughout the country who are just taking up X-ray work and need every possible guidance in order that they may intelligently apply this great therapeutical force. As much skill, of its own kind, is needed to properly run an X-ray generating outfit as is required to properly perform abdominal operations; and the reason why certain surgeons get no aid from either their X-ray examinations or treatments is because they do not know how to operate their own outfit, or those to whom they trust that part of their work are inexperienced and ignorant. Those who have an idea that X-rays can be turned on like water from a faucet, by anyone, and good results obtained, belong to the same category as those who expect to carry themselves around their rooms by lifting upon the straps of their own boots. The time is here when in surgery X-ray diagnosis and therapy takes its place beside general anæsthesia and aseptic technique, and it behooves all operative surgeons to thoroughly understand the subject, even if they do not personally operate an outfit.

The case herewith reported was an out-patient, and I have to regret that no blood examinations were made. No section from the growth was taken, first, from cosmetic reasons; and, second, because I have come to feel that even the cutting into malignant growths for the removal of specimens of tissue for microscopic examination is frequently harmful, as it opens up new lines for absorption into the general system and hastens metastases. In this case no treatment, neither internal nor external, was used, excepting the X-rays.

On September 22, 1902, Mrs. C. L. was referred to me by Dr. H. C. Gordinier, of Troy, N. Y., with the diagnosis of mycosis fungoides, the disease affecting the back of the patient's neck, nose, and upper lip. The following facts are taken from my case book:

This patient is sixty years of age, and a housewife by occupation.

Patient's father died at seventy-seven, of some disease of the kidneys, and her mother at the age of eighty-two, of asthma. Patient has no living brothers, but three who are dead, one having been drowned and the other two of causes not known. Patient has five living sisters, all of whom are well, and no sisters dead.

She never had any severe sickness, and is the mother of eight children.

The patient complains of three distinct growths (which are described below): one in the back of the neck and not shown in the picture, one on the nose, and one on the upper lip.

Cross-examination shows that patient has no headache, but has frequent attacks of dizziness; that she can see, smell, taste, and hear in a normal manner; that there is neither cough nor dyspnœa, pain in chest, nor palpitation of the heart; that the appetite is good, neither dyspep-

tic symptoms nor constipation; that there has been no tendency to diarrhœa or loss of flesh; that there has been neither insomnia nor enlargement of the lymphatics.

FIG. 1.

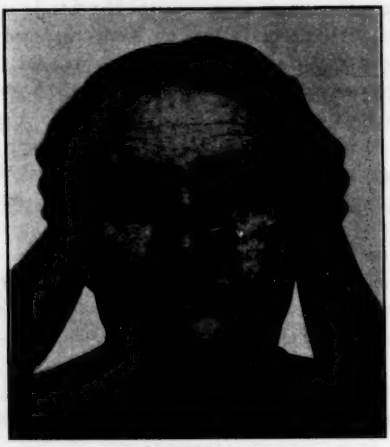
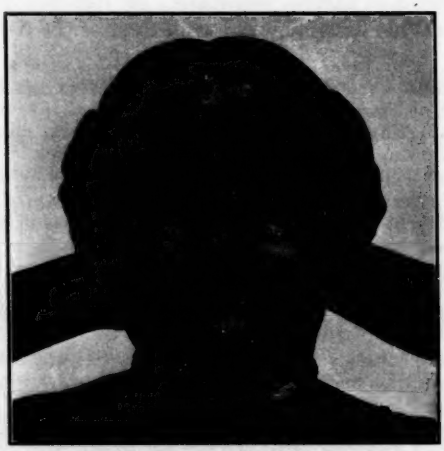


FIG. 2.



The patient's present illness began about ten years ago by the appearance on the back of her neck of a small red point, which gradu-

ally enlarged in all directions until it became a large red patch about two inches in diameter. This area of diseased skin itched to quite a degree, and after having existed for about four years small, raised, hard lumps appeared in the margin thereof. These last-mentioned lumps or papules increased in size until lately, when they coalesced into a hard, raised margin. At present the area affected is two inches by one and one-half inches in diameter, and the above-described margin is raised one-half inch above the surface of the skin. This margin is hard, and at points is covered by a black, fluffy exudate. The centre of this patch is on a level with the skin and is covered by thin, white scales of epidermis. The margin of this as well as of all three growths is sharply defined. Along the upper edge of the margin of this growth a process of ulceration is in progress. About three years ago the same process began at a point on the left side of the nose, and shown in Fig. 1, which has gradually enlarged until it has now the appearance shown in the figure. This patch measures one and one-half inches by one inch, and is raised at its highest point three-quarters of an inch above the normal surface of the skin. It is red in color and very nodular. It is quite hard, and at points there are small areas of ulceration. Projecting from the centre of this growth, and well shown in the photograph, is a bluish-red, cystic-looking outgrowth which looks exactly like a distended hemorrhoid. About six months ago the same process appeared on the upper lip, but here the process took on a distinctly ulcerative action, as we find a sharply defined ulcer, with a raised margin, and which goes so deeply as to nearly penetrate the entire thickness of the lip. This ulcer is one-half inch in diameter and is well shown in the first photograph, and the healed scar of it in the second.

The treatments were given from a Queen 12-inch coil and a Sayen tube, and are detailed below.

ABBREVIATIONS: = 3 inches means the length of spark backed up at the coil terminals when the tube was in operation.

D means the distance of the nearest point of the surface of the tube from the nearest point of the growth.

T means the length of the exposure in minutes.

In all cases the healthy parts were protected by two thicknesses of T. lead-foil.

September	23.	= 3	inches.	D 5	inches.	T 10	minutes.	On nose and lip.
	24.	= 3	"	D 5	"	T 10	"	On nose and lip.
	24.	= 3	"	D 5	"	T 10	"	On back of neck.
	26.	= 3	"	D 5	"	T 10	"	On nose.
	26.	= 3	"	D 10	"	T 10	"	On neck.
	29.	= 3	"	D 8	"	T 10	"	On lip.
	29.	= 3	"	D 8	"	T 10	"	On neck.
October	1.	= 4	"	D 7	"	T 10	"	On lip.
	1.	= 4	"	D 7	"	T 10	"	On nose.
	3.	= 3	"	D 6	"	T 10	"	On lip.
	3.	= 3	"	D 10	"	T 10	"	On nose.
	6.	= 4	"	D 7	"	T 10	"	On lip.
	6.	= 4	"	D 7	"	T 10	"	On nose.
	8.	= 3	"	D 8	"	T 10	"	On lip.
	8.	= 3	"	D 8	"	T 10	"	On nose.
	10.	= 3	"	D 10	"	T 10	"	On lip.

The lip is now apparently entirely well.

October	10.	= 3	inches.	D 10	inches.	T 10	minutes.	On nose.
	13.	= 3	"	D 12	"	T 10	"	On nose.
	13.	= 3	"	D 12	"	T 10	"	On neck.
	15.	= 3	"	D 10	"	T 10	"	On nose.
	15.	= 3	"	D 10	"	T 10	"	On neck.
	17.	= 3	"	D 10	"	T 10	"	On nose.
	17.	= 3	"	D 10	"	T 10	"	On neck.
	22.	= 3	"	D 10	"	T 10	"	On nose.
	22.	= 3	"	D 14	"	T 10	"	On neck.
	24.	= 3	"	D 10	"	T 10	"	On nose.
	24.	= 3	"	D 10	"	T 10	"	On neck.
	27.	= 3	"	D 10	"	T 10	"	On nose.
	27.	= 3	"	D 10	"	T 10	"	On neck.
	29.	= 3	"	D 10	"	T 10	"	On nose.
	29.	= 3	"	D 10	"	T 10	"	On neck.
	31.	= 3	"	D 10	"	T 10	"	On nose.
	31.	= 3	"	D 10	"	T 10	"	On neck.
November	3.	= 3	"	D 10	"	T 10	"	On nose.
	3.	= 3	"	D 8	"	T 10	"	On neck.
	7.	= 3	"	D 3	"	T 10	"	On nose.
	7.	= 3	"	D 3	"	T 10	"	On neck.
	10.	= 4	"	D 10	"	T 10	"	On nose.
	10.	= 4	"	D 10	"	T 10	"	On neck.
	12.	= 3	"	D 4	"	T 15	"	On nose
	12.	= 3	"	D 8	"	T 10	"	On neck.
	14.	= 3	"	D 5	"	T 15	"	On nose.
	14.	= 3	"	D 6	"	T 10	"	On neck.
	19.	= 3	"	D 4	"	T 10	"	On nose.
	19.	= 3	"	D 4	"	T 10	"	On neck.
	21.	= 2	"	D 2½	"	T 10	"	On nose.
	21.	= 2	"	D 5	"	T 10	"	On neck.
	24.	= 3	"	D 3	"	T 10	"	On nose.
	24.	= 3	"	D 5	"	T 10	"	On neck.
	25.	= 3	"	D 3	"	T 10	"	On nose.
	25.	= 3	"	D 5	"	T 10	"	On neck.

Mild dermatitis appearing on nose and neck, the scabs are pulled off now as far as possible before beginning each treatment.

December	1.	= 5	inches.	D 10	inches.	T 10	minutes.	On nose.
	1.	= 5	"	D 10	"	T 10	"	On neck.
	5.	= 5	"	D 4	"	T 10	"	On nose.
	5.	= 5	"	D 5	"	T 10	"	On neck.
	22.	= 2	"	D 4	"	T 10	"	On nose.
	22.	= 2	"	D 4	"	T 10	"	On neck.
	31.	= 2	"	D 1½	"	T 10	"	On nose.
	31.	= 2	"	D 1	"	T 10	"	On neck.

The parts in question are now symptomatically well, all that can now be seen being a slight hyperæmia of the skin.

REPORT OF CASES OF POISONING BY FRUIT OF RICINUS COMMUNIS.

By W. N. Bispham, M.D.,
FIRST LIEUTENANT AND ASSISTANT SURGEON, U. S. A.

While serving as post surgeon at Cabana Barracks, Cuba, several cases of poisoning from eating the beans of *ricinus communis* or castor plant occurred, which, on account of some peculiar features they presented, I think should be reported.

The clinical histories of these cases are as follows:

Case I.—C., general prisoner, entered the hospital on January 6th; ate fourteen beans on January 4th in the evening. Felt very sick after supper. He was much nauseated, and vomiting and purging began at 10 P.M. Paroxysmal pain over region of liver, and paroxysmal cramps in limbs were also noticed. This continued all night, but got no worse. On entrance to hospital the above-mentioned symptoms were noticed and were of great severity. He had a temperature of 99° F., pulse 70, respiration 20. No other symptoms were noticed. His blood was not examined. Urine showed nothing abnormal. Hot bottles were applied to sides and morphine administered hypodermically. Under this treatment, combined with liquid diet and absolute rest, the patient was well in three days.

Case II.—J., general prisoner, entered hospital on January 5th; ate six beans on January 4th in the evening. Taken sick at 2 P.M., January 5th. Nausea, vomiting, and purging of a very violent nature were his principal symptoms. Paroxysmal pain over liver and limbs; headache and griping on having passage from bowels were also noticed. These continued on his entrance. Temperature 99° F., pulse 70, respiration 20. Blood was not examined. Examination of urine showed specific gravity 1033, lessened amount of phosphates, increased amount of sulphates, with a trace of albumin. No casts. This patient also recovered rapidly under the same treatment as Case I.

Case III.—S., general prisoner, entered the hospital on January 5th; ate one bean on January 4th after supper. Was taken sick at 9 P.M. Had almost the identical symptoms as the two preceding cases, with his vomiting and purging much more severe. He had no cramps in limbs until twelve hours after the attack. Temperature 95.3° F., pulse 102, respiration 24. Blood was not examined. Examination of urine showed specific gravity 1026, lessened amount of alkaline phosphates and increased amount of sulphates. No abnormalities. This patient on entrance was very ill, and for the first six hours his chances of living seemed small. I immediately gave him morphine and atropine hypodermically to relieve his severe abdominal pains, and put him in bed well covered, with hot bottles to his sides and feet. I also gave him strychnine sulphate hypodermically to stimulate his heart. His surface temperature was so low that I put two men to rubbing his limbs, which action seemed to make him more comfortable. After the

first twelve hours he continued to improve very rapidly, and was up and at work by the end of the week.

CASE IV.—B., Eighteenth Company, Coast Artillery, entered the hospital on January 5th; ate four beans on January 4th between 2 and 3 P.M. Was taken sick at 6 P.M. His symptoms were almost identical with those of Case II., and about as severe. Temperature 98.1° F., pulse 82, respiration 26. Blood was not examined. Urine examination showed a specific gravity of 1024, lessened amount of phosphates and increased amount of sulphates, with trace of albumin, but no casts. Under treatment the same as in the preceding cases this patient was discharged, cured, in three days.

Immediately after the entrance of these cases in the hospital I began to investigate their previous history and obtained some very peculiar data.

The three prisoners were members of a squad which had been busy on January 4th cutting down some brush and weeds near the barracks, and Case IV. was one of the guards over this particular party. Among other kinds of plants to be cut down were a large number of castor plants (*ricinus communis*), which had about reached their maturity. One of the prisoners collected a large number of the ripe beans, and after eating some he placed the rest in his pocket, and took them back to the prison, where he shared them with several of the men, including Cases I. and III. Of these, the three who were brought to the hospital were the only ones ill, though several others were severely purged. On questioning the man who introduced the beans into the prison, he told me that he liked them so much that he had eaten more than a handful, but had not felt any bad effects other than some slight tendency to diarrhœa. The sergeant who was in charge of the detail also reported to me that he had eaten *over one hundred of the beans* and had suffered from slight cramping in the lower abdomen, while *Case IV., one of the guards, was quite ill from eating four.* I procured some of the beans from these men and found that they were truly the matured fruit of the ricinus communis.

The results of my investigation are very peculiar, and show a most marked difference in the individual susceptibility to the poisonous principle contained in the beans. Why should the eating of one bean, as in Case III., nearly kill the patient while another man consumes over a hundred with almost entire immunity from any ill effects? We often hear of deaths caused by extremely small doses of strychnine, morphine, or other poisonous drugs, but never of tolerance for doses a hundred times as great unless constant use had accustomed the body to excessive amounts. This seems to emphasize more and more the relation the individual equation has to the administration of drugs. Since I noted these cases I have carefully looked over all the records and books which were obtainable, but have seen very meagre notices of

any cases of poisoning from *ricinus communis*. In Biddle's *Materia Medica* it is stated that one bean has been known to kill an adult, and Meldrum, in the *British Medical Journal* of February 1, 1900, reported a fatal case of poisoning after eating two beans.

Since the foregoing was written the following report of a case of poisoning by *ricinus communis* was sent to me by Dr. Randolph Winslow, of Baltimore. It will be seen that the symptoms are very similar to those noted in the cases reported by me, but were more severe:

W. K., white, aged fifteen years, inmate of the House of Refuge, Baltimore, on Tuesday, November 18, 1902, was taken with violent vomiting, and it was ascertained that he had eaten several castor beans, probably about ten or twelve. His vomiting was incessant, and his bowels moved but once during the next four days. He was seen by Dr. Winslow first on Thursday, November 20th, and was then a very ill-looking boy, with sunken cheeks and wasted features, dry tongue, cool surface, rapid pulse, mottled and more or less livid skin, especially the hands, feet, and knees. The abdomen was scaphoid, and he complained of tenderness on pressure over the epigastrium. He could not take anything into the stomach without vomiting at once. He had already taken calomel and other remedial agents without success, and was now ordered to be blistered over the stomach; cocaine was administered internally and food was discontinued. He did not improve under this treatment, and two days later was removed to the University Hospital. A hypodermic injection of morphine, one-quarter of a grain, was given him on his arrival at the hospital, and he only vomited twice after his admission. Nutrient enemata were given, and twenty minim doses of bovinine by the mouth at one-half hour intervals were given. The bovinine with milk was increased, and, finally, he was able to take soft eggs and soft toast, but his general condition did not improve. His mind became impaired, sordes collected on his teeth, the tongue became dry, skin cool, and peculiarly mottled, varying from a dusky pink to bluish in color. The temperature was subnormal until November 28th, when it began to rise, and just before his death it reached 104°. The pulse varied from 100 to 120 and upward, and was always weak and thready. Profuse diarrhœa set in, he emaciated more and more, and died on the twelfth day of his sickness, apparently from the effect of the poison on his heart. His blood seemed to be disintegrated, and there was a hæmic murmur in his heart. The urinary examination showed some albumin and granular and hyaline casts, specific gravity 1010.

REVIEWS.

A TEXT-BOOK OF THE SCIENCE AND ART OF OBSTETRICS. By HENRY J. GARRIGUES, A.M., M.D., of New York. 8vo., pp. 844, with 504 illustrations. Philadelphia: J. B. Lippincott Company, 1902.

DR. GARRIGUES' previous contributions to medical science have been so numerous and valuable that the American profession will gladly welcome this text book from his pen. In his preface the author states that the principles of obstetric science are so well defined that they may be stated in a clearly didactic manner. He has not aimed to write a book of reference, although in a portion of the volume where recent advances in obstetrics are dealt with he frequently refers to obstetric literature. The book is abundantly illustrated and divided into sections of convenient length which place the subject-matter clearly before the reader.

When the author comes to treat of the conduct of normal labor he gives, as we should expect, full and concise directions regarding preparations. He gives some very practical directions regarding the management of the friends of the patient. He describes in full his armamentarium as the outfit of a specialist. He does not mention in this outfit a sterilizer, which to our mind is one of the most important appliances. He states that an aseptic outfit, by reason of its expense and weight, is undesirable, and believes that a doctor has not time to pass an hour in the kitchen sterilizing his instruments. He states that is is not feasible to have sterilized towels, sheets, and aprons in a private house under ordinary circumstances. We cannot sympathize with his position in this regard. Very simple and inexpensive metal pans, in which the obstetric forceps and other instruments ordinarily employed may be carried are available, and instruments may be boiled without difficulty over alcohol lamps which form a part of the physician's outfit. While in ordinary deliveries clean linen is sufficient, in obstetric operations in which the birth-canal is entered by the hand or instrument of the obstetrician, we believe that the limbs of the patient should be covered with sterile material, and the lower portion of the abdomen as well. We find no difficulty in carrying a small package containing sterilized materials which we use in forceps and other operations. The objection that this calls for a heavy outfit may be met by dividing obstetric instruments into two classes: first, those ordinarily used, including the obstetric forceps; and, second, instruments for craniotomy, symphysiotomy, or abdominal section. These may be divided into two packages, the physician taking with him first those instruments ordinarily needed. In complicated cases there is almost invariably abundant time to secure instruments not usually required. While we agree with the author that antisepsis is most available in obstetrics, we also believe it to be imperative upon the obstetrician to perform obstetric operations in as thorough and careful a manner as is possible, and our recommendations in this

regard are based not upon theory but upon personal experience. It may be urged against our opinion that this makes confinement a complicated affair, and it is impracticable with persons of moderate circumstances. We have not found it so. In addition, if patients understand that confinement may become at any moment a complicated and serious matter they will more readily seek accommodations in maternity hospitals, where they can be attended at moderate expense, occupying private rooms for a reasonable price. Persons of moderate means, we believe, should be encouraged to do this, and in our experience the results are most satisfactory to patient and physician. A further contention in this matter may be advanced that the general practitioner who has no hospital connections usually practises obstetrics. When the difficulty of obstetric practice is considered, and the many conditions necessary for its successful conduct in complicated cases, it is readily seen that the general practitioner is poorly fitted for this work. It is and must still more become the work of specialists who have hospital accommodations at their disposal.

In dealing with eclampsia the writer does not recognize the modern pathology of the condition. The statement that he examines the urine of even apparently healthy women once a month during pregnancy, and his belief that the appearance of albumin is very ominous, shows that he does not recognize a considerable and most dangerous class of cases. In the presence of convulsions he believes that he takes a wise course in not actively emptying the uterus, but in assisting labor when it is begun. He draws attention to Stroganoff's statistics.

In delivery by forceps, his illustration of Walcher's position shows the patient with her feet touching the floor and very imperfectly suspended across a bed. We have found in using Walcher's position that the feet must not touch the floor, and that the services of two strong persons are necessary to hold the patient upon the table. We join heartily with the author in his statement that none but axis-traction forceps should be employed. He personally prefers Simpson's, and we find Simpson's ordinary forceps with the tape attachment for axis traction a most useful instrument for all conditions. We agree with him in his estimate of the scientific value of Tarnier's forceps, although it seems to us that he is optimistic in his statement that in conducting delivery with axis-traction forceps the operator should depend entirely upon the relative distance between the traction rods and the handles of the forceps. We believe that it is necessary to palpate the head at frequent intervals, and sometimes to keep the fingers in contact with the head during traction, to observe the progress of the head through the cavity of the pelvis.

The author speaks with authority upon symphysiotomy, for he has done the operation successfully. He believes its safe and proper field lies in flat pelves, in cases where the conjugate is from 7 cm. to 9 cm. He recognizes the difficulty of basing a decision upon pelvic measurements only. His description of the operation is excellent, and he recognizes the value of the suprapubic method of incision. The author does not share the modern skepticism and distrust of symphysiotomy, probably because he has been personally successful. We believe with him that the operation has a distinct field, but we should limit it to the case of multiparous women in whom the birth-canal is easily distensible, and in whom very moderate disproportion exists between mother and child.

In this narrow field, when the operation can be done in maternity hospitals, we believe that it will save the lives of mother and child.

The writer gives a clear account of Cæsarean section, advising the employment of a rubber tube for constriction if needed. He clamps bleeding sinuses to stop hemorrhage, and waits for a few moments, with the hope that the placenta will be spontaneously separated. In the event of bleeding he would pour into the uterus hot salt solution or hot water, or a 1 per cent. mixture of chloride of iron. This latter seems to us a dangerous expedient. The uterus is replaced and the omentum pressed above it to prevent intestinal obstruction. An extensive array of remedies for vomiting after Cæsarean section is given, and also a number of remedies for shock. Possibly our experience has not been as great as the author's, but in 27 cases we have never had to give a remedy for vomiting. If the patient requires stimulation, strychnine, hypodermically, aseptic ergot, hypodermically, and transfusion have been the only remedies required. Secondary hemorrhage the author would treat by intra-uterine injection which, we believe, would be a dangerous proceeding. We should prefer to repeat strychnine and ergot hypodermically. He does not believe that Cæsarean section should be accompanied by removal of the ovaries.

In dealing with cases in private houses he would explore the uterus by the fingers, and thoroughly douche it. He is not in favor of the use of the curette. He urges the employment of suppositories of iodoform, with vaginal douches every three hours, and he recommends, in addition to the administration of ergot, the application of the faradic current over the uterus. He would also use cold applications upon the abdomen, except when the patient's vitality was low, when hot applications might be employed. We have not found it possible in many cases to thoroughly explore the uterus with the finger after delivery without making undue disturbance, and the finger has proved too short in many cases for the purpose. We believe that the uterus should be thoroughly explored and douched with a blunt-edged douching curette, which removes tissue ready to come away without doing violence. Frequent vaginal douches have been largely discarded by obstetricians at the present day in septic conditions, and we believe properly. We formerly employed suppositories of iodoform, but we have seen as good results without them. Nuclein has given good results in his hands used hypodermically in doses of 10 minims and increasingly twice a day. Hypodermoclysis is recognized as valuable, with free stimulation, the use of cold to reduce fever, and sufficient opium to control pain. The author does not recommend hysterectomy, and in this the majority of obstetricians are at present with him. He fully describes abscess in the pelvis from puerperal infection and the best methods for draining such abscesses.

We believe that the author has written a book especially valuable for the general practitioner. It is based upon wide experience in the delivery of patients in their homes and upon a good acquaintance with obstetric literature in German and French. The writer shows a liberal tendency in therapeutics, which embraces "Red Raven splits," patent foods for infants, silver ointment, and varied methods of treatment! We believe his pharmacopœia to be more exuberant than valuable. He is as far as possible removed from a therapeutic Nihilist, which we think scarcely gives the patient opportunity to recover through the inherent recuperative power of the body. E. P. D.

CANCERS AND OTHER TUMORS OF THE BREAST. RESEARCHES SHOWING THEIR TRUE SEAT AND CAUSE. BY CHARLES CREIGHTON, M.D., Sometime Demonstrator of Anatomy, Cambridge University. Author of *Contributions to the Physiology and Pathology of the Breast*. With twenty-four lithographic plates. London: Williams & Norgate, 1902.

THIS is really a remarkable and very important work upon the breast. It has for its basis the discovery, for which its author claims priority, that there are tumors of the mammary region which arise not from the breast proper, but from glandular structures having the character of the axillary sweat glands, which he has shown to be present in a surprising number of breasts, while in all portions of these structures he finds that all sorts and varieties of mammary tumors originate, the true mammary structure often remaining passive, or in many breasts being obsolete. A large part of the work is given up to embryological considerations, for which the English training seems to better fit men than that of any other country. In fact, the whole work is a beautiful illustration of the application to human pathology of an extensive knowledge of comparative anatomy and pathology.

The author begins by describing the excretory skin glands of the vertebrates, taking as a prominent illustration the so-called thumb gland of the frog, which seems to be a true sexual organ, found only in the male frog, and becoming large during the breeding season. It has an excretion which looks milky, but is not fatty, and is supposed to contain some albuminous material like that found in certain poison glands. Coming to the mammals, he describes the peculiar glands of the monotremes, which likewise have peculiar sexual glands as well as mammary organs.

Another very remarkable skin gland is met with on the back of the hippopotamus, and gives forth the so-called bloody sweat of that animal. its excretion being of a port-wine color. Next, the larger sweat glands of man are described. For instance, those large ones in the armpit of certain women, which may form a cluster even as large as a hen's egg, and which yield a somewhat copious secretion. Glands of this kind are also found in the loose tissue about the nipple as well as in the scrotum and labia. Attention is called to the fact that sweating from the breasts may be profuse. He traces also an analogy between the malignant tumors of these and those of the large sweat glands seen, for instance, in chimney-sweeper's cancer and cases occurring upon the lip.

Creighton also believes that the sebaceous glands about the nipple may of themselves secrete a milk-like fluid if not typical milk. The occurrence of tubular glands with the distinctive structure of sweat glands throughout the human breast, as well in the centre of the organ as around its margin, is insisted upon throughout the book, and in these anomalous sweat glands its author finds the explanation for many of the tumors met with in this locality. In fact, he traces the majority of new growths rather to these anomalous structures than to the proper mammary lobules and ducts. His pages bristle with anatomical facts culled from nearly all the vertebrates, proving this possibility and the frequency of its occurrence. He shows also how many of these lesions are to be regarded as reversions to the primitive type of mammary organ; sometimes so slight as to be easily overlooked, at other times, especially at the menopause, predominant. The parts that thus revert do not

undergo the same atrophy as the true mammary portions do at the period of menopause, and so he would regard the so-called involution cysts, which are usually taken for dilatations of the milk-ducts, as real expansions of the tubular glands already alluded to. So with the fibromatous nodules which are so frequently found in the breast, the author apparently demonstrates that the glandular elements around which they arise are not those of the mammary structure, but are either the tubular glands of primitive sweat-gland type or rudiments of mammary lobules which have never developed into a typical structure.

Coming now to the malignant diseases of the breast, it is stated that although sarcoma has a well-marked clinical individuality, it is usually the sequel of some earlier morbid condition rather than an original disease, and has a tube-gland element which is essential to its existence. The claim is made that many cases of sarcoma are in effect the eventual acute stage of some chronic tumor, one or more fibromata of years' duration being suddenly excited by menopause or injury, and rapidly becoming sarcomatous. The complete theory of these tumors is believed to be that original tubular glands become blocked by their own epithelium and so disturbed that a compensatory activity takes place in the vascular stroma. While the author does not introduce the modern term, perithelioma, it would appear from his description that many of these cases are of this type.

Chapters IX. and X. are devoted again to comparative pathology, especially of tumor formations in the domestic animals, from which many most instructive lessons are deduced.

Chapter XI. is devoted to scirrhus. In this chapter, as in that on sarcoma, the author shows a rather curious blending of the old and new notions, there being a tendency to revert to the old clinical distinctions without a clear-cut difference founded upon histology. In fact, he alludes to the contrast between the two diseases, "or between soft and hard cancer of the breast," as being very marked, and even facilitating diagnosis. It is, however, due to him to say that he lays no little stress on the actual complexities of these cases. The final chapter is devoted to a summary of the pathology and etiology of breast tumors. He sums it up to this effect, that the proper mammary structure, which is subject to periodical involutions and climacteric atrophy, has really no part in the morbid growths of the breast, but that these arise from certain not unusual anomalies of development which are not subject to periodical changes, the most important of which are tubular glands of the type of large sweat glands. These anomalies occur in many breasts, healthy as well as diseased, consequently he looks for their causes to the evolution of these structures from the primitive glands of the skin, with frequent tendencies to reversion.

From the comparative pathologist's point of view this work is a model. From the standpoint of the modern surgeon it is unsatisfactory in that there is nowhere the slightest reference to the parasites, which are in all probability the exciting causes of cancerous growths. Such views as those enunciated by the author are of the greatest importance, as are also the facts which he has marshalled from so many different sources. What is now imperatively needed is a still more broad conception of malignant growths which shall furnish us a treatise in which there shall be reconciled the facts from both sides in connection with broad general principles. For the author's industry and wide comprehension of com-

parative anatomy and pathology we desire to express our unbounded admiration. We seem, however, to read between the lines that were his knowledge combined with a large clinical experience, a different, or rather a much broader, interpretation might be given to certain phenomena which he has described from his restricted point of view. Nevertheless, there is so much that is new and novel in the book that, after a careful examination, the reviewer still feels that it is a work of the greatest importance, and should be in the hands of every student of the subject. R. P.

THE ANATOMY OF THE HUMAN PERITONEUM AND ABDOMINAL CAVITY. Considered from the Standpoint of Development and Comparative Anatomy. By GEORGE S. HUNTINGTON, M.A., M.D., Professor of Anatomy, College of Physicians and Surgeons, Columbia University, New York City. Illustrated with 300 full-page plates, containing 582 figures, many in colors. Philadelphia and New York: Lea Brothers & Co., 1903.

THIS superb new work of Dr. Huntington's marks almost a new era in the making of medical books in this country. Its lavish illustration and its most attractive presentation will make it a beautiful addition to the library of every student, while its subject-matter will characterize it as a most important one. It certainly substantiates its author's claim that it is intended to emphasize the value of embryology and comparative anatomy in elucidating the problems of human anatomy.

The intestinal canal is first considered, and attention is called to the fact that it gives origin to two quite different kinds of appendages: those derived by budding from its hypoblastic epithelium, including those organs which, like the salivary glands, liver, pancreas, and lungs, still retain their original connection with it, as well as those, like the thyroid and thymus, which have lost their primitive connection with it; and those which are embryonic appendages, like the omphalo-mesenteric duct and the allantois. After this introduction, Part I. is devoted to the anatomy of the peritoneum and general abdominal cavity. It is shown how the primitive stomach or foregut is formed by the passage between the branchial cavity and the midgut, which is within the area supplied by the vagus; hence the peculiar distribution of this nerve finds its explanation in this derivation of the stomach. The form of the stomach depends upon the influences exerted by the habitual amount of food required by the animal, by its digestible character, by the size and shape of the abdominal cavity which contains it, by structural modifications designed to increase the action of the gastric juice on food, and upon its assumption of special functions, like storage of food for subsequent use or mastication.

The factor which leads to the peculiar arrangement of the intestinal tube within the abdomen is shown to be the rotation which its various portions undergo in order to be suitably disposed within the limits of a closed sac. Failure of rotation and arrest of development lead occasionally to well-marked anomalies.

Part II. deals with the anatomy of the peritoneum in the supracolic compartment of the abdomen. One of its most interesting features is

the development of the pancreas, in which a very satisfactory explanation is given of the adult arrangement of the ducts and their variations. He quotes Schirmer, who examined the arrangement of the pancreatic ducts in 105 specimens. In 56 of these the duct of Santorini passed from the main duct into the duodenum above the opening of the common duct; in 19 it was developed, but had no independent opening; in 4 cases it formed the only pancreatic outlet. It is also shown how in certain of the teleosts the pancreas is concealed from observation within the liver, or scattered in the form of small lobules between the layers of the mesentery. The section concerning the liver is also exceedingly interesting. Not much is said about the gall-bladder; in fact, not quite as much as we could wish. The author's statement is, that its existence depends largely on the character of the food and the habitual type of digestion. In those animals whose digestion is carried on nearly continuously the gall-bladder is absent, as well as in several birds. This very variability emphasizes that the gall-bladder is only a modified portion of the hepatic duct system, as is shown by its development.

The comparative anatomy of the hepatic venous circulation is most entertainingly set forth, but it would take up too much space to try to even epitomize it. The relation of the hepatic peritoneum to the lesser sac is amply described and illustrated, while the foramen of Winslow is fully described.

Part III. is devoted to the large and small intestine, the ileocolic junction, and the cæcum. We are reminded that the human cæcum and appendix are in part rudimentary structures, representing a portion of the intestinal tube which has lost its original functional significance, and consequently exhibits wide variations. The reader will be duly impressed by the fact that representatives of all the main types of ileocolic junction are found within a very limited range, as within the confines of a single order, whose various members may differ very widely in habit, and in the kind and quantity of their food.

Part IV. is given over entirely to the morphology of the human cæcum and vermiform appendix. The fact is stated that a few instances of congenital absence of the appendix have been observed, to which the reviewer might add another. This portion of the book will be scrutinized with great interest by anatomists, physicians, and surgeons alike, and will amply repay most careful perusal. Nearly half of the book, with some 150 plates and nearly 300 figures, is devoted to this part of the human body, and the lavishness of illustration may be inferred from this statement.

The author's encyclopedic knowledge of comparative anatomy and the astonishingly great resources of the Columbia University Museum have been utilized to the best advantage in furnishing examples from every part of the animal kingdom. The work exceeds in value and in pictorial richness everything of the kind previously attempted, and speaks most highly for American talent and studiousness. It constitutes a treasury of anatomical lore and will be invaluable to all who are interested in this department of knowledge. The publishers have done their part sumptuously. The pages and the type are large, and the binding beautiful. But one little feature calls for criticism: it is a pity that the time of busy students should be wasted in cutting the pages of a work of such great value.

R. P.

THE PRACTICE OF SURGERY. By HENRY R. MARTIN, M.D., and B. FARQUHAR CURTIS, M.D. Third edition. Philadelphia: J. B. Lippincott Company, 1902.

THAT another addition of this admirable book has appeared attests its appreciation by the general practitioner, for whom it is primarily written.

To present all the subjects with which surgery deals to day within one volume, and to do it attractively and well, is a great task. This has been accomplished by the authors.

The active surgeon finds it more and more difficult to keep in touch with the whole field of surgery. He can hardly keep informed without literary assistants. It is necessary for the general practitioner, in order to keep abreast of surgical progress, to make use of such a contribution to surgical literature as this book affords.

The illustrations of the volume are being added to and improved upon. It is a pleasure to see old-time wood-cuts which do not illustrate passing out of surgical literature and their places taken by photographs.

The chapters upon Fractures and Dislocations are extremely practical and helpful.

The chapters on Operative Surgery are perhaps necessarily illustrated by old-time plates. It will be refreshing to see these replaced by something better.

The article on Bandaging is most attractively illustrated. The treatment suggested for the various surgical diseases described is that followed by the authors, and is eminently satisfactory, most of the details of treatment following common custom. It is far wiser in a book of this sort to describe one or two methods of treatment which are generally satisfactory than to confuse the reader by a description of many methods.

The book is thoroughly modern.

It is the best general surgery which the reviewer has seen in English.

C. L. S.

THE PHARMACOLOGICAL ACTION AND THERAPEUTIC USES OF THE NITRITES AND ALLIED COMPOUNDS, INCLUDING THE CROONIAN LECTURES FOR 1893. By the late DANIEL JOHN LEECH, M.D. (Lond.), D.Sc. (Vict.), F.R.C.P.; Senior Physician to the Manchester Royal Infirmary, and Professor of Materia Medica and Therapeutics in the Owens College. Edited by R. B. WILD, M.D. (Lond.), M.Sc. (Vict.), M.R.C.P., Leech Professor of Materia Medica and Therapeutics in the Owens College. Pp. 187. Manchester: Sherratt & Hughes, 1902.

DOUBTLESS many of our readers will recall the distinguished presence of the author as Chairman of the Section on Therapeutics at the meeting of the British Medical Association at Montreal in 1897. Many more have not only read but studied his contributions to that branch of medical literature in which he was pre eminently a master, and have felt that for him chemistry and physiology, the library, and the laboratory in pharmacological studies were but means to an end—therapeutics—in order that suffering might be assuaged and life prolonged or saved.

"The Relation of Pharmacology to Therapeutics" (1884) is scholarly, and even eighteen years later is full of interest and suggestion. "Spiritus Ætheris Nitrosi" (1883), "Ethyl Nitrite" (1888), and a comparison of these in the latter year seems at this time a presentation of well-known facts, yet when published had great influence in shaping medical opinion and determining therapeutical practice. Intermediate (1885) appeared the paper "On the Duration of Action of Medicines, with Especial Reference to the Nitrites and Nitroglycerin." The important feature of the book is to be found in the subjects discussed in the Croonian Lectures of 1893, to which we have in another place called attention in this JOURNAL. Here the facts and the possibilities of combinations of various bases with nitrate and even nitrate radicals were presented as they never had been before, and even reading the lectures to-day they are fully abreast of the times; yet in the summary (p. 159) the author fully recognizes the fact that much as he had already accomplished a still larger field invites investigation. To add to the value of the work a most excellent bibliography is appended, and the thirty-eight plates show graphically the statements made in the text. Although most advanced clinicians are conversant with the author's conclusions, and even his papers, as they originally appeared, all will welcome their assembling in one volume, revised in part to 1900. In presenting this volume, in a way a monument to the memory of its brilliant author, the editor has shown not only ability, which his own writings have demonstrated, but as well a sympathy with both the lamented author and his work. R. W. W.

ATLAS AND EPITOME OF TRAUMATIC FRACTURES AND DISLOCATIONS. By PROFESSOR DR. H. HELFERICH, Professor of Surgery at the Royal University, Greifswald, Prussia. Authorized Translation from the German. Edited by JOSEPH C. BLOODGOOD, M.D., Associate in Surgery, Johns Hopkins University, Baltimore, Md. Fifth edition, revised and enlarged. With 216 colored illustrations on 64 lithographic plates, and 190 figures in the text. Philadelphia and London: W. B. Saunders & Co., 1902.

IT is fortunate for authors and publishers, if not for students and readers, that all the elements of a topic are rarely if ever treated and illustrated in one book with an equal degree of completeness and success.

In the province of pathological anatomy of fractures and dislocations, the brilliantly—almost diagrammatically—colored lithographic plates of Helferich's *Hand Atlas* may be said to be unsurpassed. But in the matter of skiagraphic illustration, although some of the plates are excellent, it cannot compete with the work of Hopkins, nor in treatment with that of Scudder.

In his first edition, the author states that his *Atlas and Epitome* is intended for the student and also as a ready handbook of reference for the practitioner. That this work is now in its fifth edition testifies that its excellence has been appreciated. Its small and compact form make it particularly helpful in fulfilling the author's purpose. Its conciseness, completeness, and admirably illustrative character make it particularly serviceable to the student of the anatomy of fracture and dislocation.

From the American standpoint the suggestions on treatment are marred by unnecessarily complicated apparatus and requirements, such as recumbent and weight-extension and counter-extension treatment in simple fractures of the arm, and the statement that an anæsthetic and two assistants are preferable for the reduction of a simple Colles fracture. This fault of national idiosyncrasy of method is minimized, and the value of the book for use in this country much increased by Dr. Bloodgood's many and pertinent editorial notes. The latter are mainly in supplement to the text, sometimes in emphasis of it, and occasionally in frank advance of a contrary but valuable opinion. J. M. S.

SURGICAL ANATOMY: A TREATISE ON HUMAN ANATOMY IN ITS APPLICATION TO THE PRACTICE OF MEDICINE AND SURGERY. By JOHN B. DEAVER, M.D In three volumes. Vol. III. Abdomen, Pelvic Cavity, Lymphatics of the Abdomen and Pelvis, Thorax, Lower Extremity. Philadelphia: P. Blakiston's Son & Co., 1903.

WHEN we reviewed the first two volumes of the work,[1] of which the third and last is before us, we remarked on the great difficulty we experienced in rendering a just judgment. In short, we admired but could not approve. Our state of mind is now precisely what it was then. We have nothing to add and nothing to retract as regards our general remarks on the book. There are still the same causes for admiration and criticism. The plates are magnificent, and there is a profusion of them. Those of the abdomen are excellent, and among them we must particularly mention the view of the relations of the peritoneum to the posterior wall. We could have wished for more figures of frozen sections. There are, indeed, some very good transverse sections of the thorax; but we think it should have been stated that at least some of them are through the thorax of a young child. We regret that there are no similar slices of the abdomen. Plate CCCLXXXII., showing the relations of the kidneys, spleen, pancreas, and duodenum, is so good that we wish all the more for others like it. Of late it has become an axiom that the true shape and relations of organs are to be learned only on bodies hardened by either cold or reagents; but very little use has been made of these methods.

In our first notice we said that the anatomy was that of a former epoch. As evidence that this still holds good, we may mention that the right bronchus is said to be more horizontal than the left, and that the stomach is described with the lesser curvature above and the greater below. We should add that it is stated that when the stomach is empty the lesser curvature is directed upward and the greater curvature downward, but even this concession to modern views is hardly adequate. Three-fourths of the organ are said to be in the left hypochondrium, but even the diagram (Plate CCCXLVII.), exaggerating, as it does, the left portion of the stomach, does not support the assertion. The structures in relation to the various organs are merely enumerated in what may be called a compendium-like manner.

[1] THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, vol. cxxi., 1901.

And so on! We could bring more praise and more criticism, but we prefer to stop. We reiterate our belief that the book will appeal to many, and are not sorry to think that with the public its merits will outweigh its shortcomings. T. D.

CLINIQUE DES MALADIES DU SYSTEM NERVEUX. PAR PROF. RAYMOND. (Année 1897–1898.) Quatrième Série. (Année 1898–1899.) Cinquième Série. Octave Doin. Paris edition.

PROFESSOR RAYMOND, following the example of his illustrious predecessor in the chair of Neurology at the Salpêtrière, publishes each year a series of clinical lectures. The volumes before us include the clinics of 1897–98 and 1898–99. Both volumes are over 600 pages in length, and are well illustrated with drawings of pathological specimens and diagrams, etc. Each subject taken up in these lectures is considered from the etiological, pathological, diagnostic, and therapeutical standpoint, and can be considered as a monograph of the subject treated. In the first volume a case of multiple sclerosis in an infant, atrophy from cerebral lesions and in tabes dorsalis, tabes and syringomyelia, lead poisoning and syringomyelia, and the differential diagnosis between juvenile paresis and cerebral syphilis deserve special mention.

In the second volume several clinics on brain tumors are presented. Several clinics are devoted to partial and sensory epilepsy. True bulbar paralysis, pseudobulbar paralysis, and myasthenia bulbaris are fully considered in different lectures. Among the other subjects considered in this volume may be mentioned multiple sclerosis, scleroderma, polyneuritis and diplegia facialis, and Pott's disease.

These two volumes are valuable contributions to neurological literature, and are of especial interest to those who would keep up with advanced neurological teaching. D. J. McC.

ÉTUDE SUR LES HÉMATOMYÉLIES. PAR LE DR. JEAN LÉPINE. Paris: Masson et Cie.

THIS work is a thorough study from an experimental, clinical, and pathological standpoint of the subject of hæmatomyelia. In the 450 pages a full description of the different forms of hæmatomyelia is given, with full consideration of the pathogenesis of the condition. He divides hemorrhage into the cord into primary and secondary groups. Of the latter he finds two groups, one due to a rupture of a vessel in the central region of the spinal cord, due to traumatism to the spine, and the other due to rupture of capillaries in congested conditions of the gray matter. The relation of traumatism to hæmatomyelia and to syringomyelia are thoroughly treated, and experimental evidence is given in support of this relation. The book is well written, and is a valuable contribution to the subject. D. J. McC.

THE GENERAL SEMEIOTICS OF VOMITING. By W. JANOWSKI, Primärarzt to the Kindlein Jesu Hospital at Warschau, 1903. Jena: Gustav Fischer.

THIS excellent monograph treats in a very comprehensive manner the subject of vomiting in all its various phases, and brings out clearly the importance which a careful observation of this one symptom may bear to the diagnosis and prognosis of certain diseases. The book, which numbers about 100 pages, is divided into two parts. The first, comprising but a small portion of the whole, serves as an introductory chapter, and takes up the general methods to be pursued in studying a patient during and between his attacks of vomiting as well as the superficial examination of the vomitus itself. The second part deals in detail with the various forms of vomiting and with the different conditions observed during the act which may be of diagnostic and prognostic importance. In the portion devoted to the gross examination of the vomitus the several physical characters, such as the volume, consistency, color, and smell, are all discussed separately, and the significance of mucus, bile, blood, and feces is dealt with at length. The book ends with a very satisfactory description of the methods employed in the chemical and microscopic examination of the fluids. W. T. L.

A TEXT-BOOK OF PRACTICAL MEDICINE. FOR THE USE OF STUDENTS AND PRACTITIONERS. By WILLIAM GILMAN THOMPSON, M.D., Professor of Medicine in Cornell University Medical College; Physician to the Presbyterian Hospital, etc., New York. New (second) edition, thoroughly revised. Philadelphia and New York: Lea Brothers & Co.

THE aim of the book, as its title indicates, is essentially practical, and, while it incorporates the latest established views, it avoids merely speculative arguments. Each standpoint (etiology, symptomatology, etc.) of a disease under discussion is given due consideration; and neither is pathology enlarged upon at the expense of treatment nor is treatment detailed to the detriment of pathology. One feels, in looking up a disease, that it will be well viewed in all its phases. There are nearly a thousand pages and about sixty illustrations. The author asserts that "curative medicine is assumed to be the final and avowed object of those who may read this volume." With that point of view he has incorporated, with the accepted and conventional theories, the results of his own experience in therapeutic measures, as well as individual observations, of any nature upon rarer conditions.

The book begins with the infectious diseases, among which are included not only acute but chronic and muscular rheumatism. Syphilis and tuberculosis are thoroughly dealt with, and typhoid fever receives forty pages. At the end of this section are a few diseases classified as infectious fevers of obscure nature, and then the infections common to men and animals. In all a little over a third of the book is occupied by this section.

Part II. takes up the diseases of the digestive system and is thorough and satisfactory. The methods of physical examination, with the tests for stomach-contents, are given in a concise and lucid manner, and the

student is led to value the chemical analyses only in their relations to signs and symptoms. The author is indeed judicial and at the same time definite. When he regulates the diet he indicates clearly along what lines it shall be done, instead of simply mentioning that the patient's eating and drinking should be supervised, a practice so common with many writers and so unsatisfactory to the student. It is unnecessary to call attention to the fact that Dr. Thompson is an authority upon dietetics.

Diseases of the intestine and those of the liver follow. Part III. takes up diseases of the spleen and lymphatic system, including the ductless glands. Splenic anæmia is called splenomegaly. In this division are the various affections of the tonsils, a much better arrangement than the old method of putting them with the digestive organs. Then follow, in three great divisions, diseases of the blood and vascular system, diseases of the respiratory system and mediastinum, and diseases of the urinary system.

There is no introduction to Part VII., which presents diseases of the nervous system, no summary of anatomy or general symptomatology. This section is a little less complete than most of the others of the book. Curiously enough the muscular dystrophies are not described. Though there is proportionately less space given to the diseases of the nervous system than to those of other classes, notably the infectious, there is sufficient for a working basis for the general practitioner. In view of the many books upon the nervous system now in use, this seems entirely justifiable.

The description of diseases of the muscular system in PartIX., of miscellaneous diseases, poisons, and drug habits and diseases due to parasites in Part X., complete this comprehensive work.

The absence of padding is a conspicuous feature of the book, which, although it contains nearly a thousand pages, is what might be called condensed. If, as Dr. Osler once said, the article on typhoid fever in a text-book on medicine is a fair indication of what the book is, the highest commendation may be given for comprehensive investigation and presentation of modern facts and theories. It is quite evidently the work of a judicial and direct mind, and must certainly prove a satisfactory account of practical medical knowledge. The style is lucid and concise. Reference is made easy by a good index, tables, and heavier type for headings or important generalizations. H. L. C.

THE INTERNAL SECRETIONS AND THE PRINCIPLES OF MEDICINE. By CHARLES E. DE M. SAJOUS, M.D. Vol. I., with 42 illustrations. Philadelphia: F. A. Davis & Co., 1903.

THE present is the first volume of a work in which Dr. Sajous has brought together with the most painstaking labor certain observations collected from literature and developed from them an entirely new theory as to the principles of medicine and therapeutics. The work is of great scope and represents a very extensive inquiry into important researches from varied sources which deal with questions in experimental medicine. The theories which the author deduces are so novel in their conception that, without further experimental proof, their true

value cannot be estimated. Dr. Sajous has traced the vital processes of the body to the functions of the ductless glands, and believes that of these the "adrenal system" is pre-eminently important. The adrenal glands themselves are considered as the source of a secretion which with the oxygen of the air forms the "oxidizing substance" of the blood. In turn these organs are directly connected with the anterior pituitary body by means of the solar plexus, splanchnic nerves, and cervicothoracic ganglia, the pituitary body acting as a governing centre for the adrenal glands. The activity of the pituitary body is sustained by means of the thyroid gland secretion, which substance consists principally of iodine. The symptoms of infections and poisons are ascribed to the overactivity or insufficiency of "the adrenal system" brought on by the action of toxins upon the system. Therapeutical measures also owe their action and their value to the stimulation or depression of the adrenal system. But certain other groups of organs are considered of vital importance to the welfare of the organism. The posterior pituitary body is viewed as the chief functional centre of the nervous system, and to it is accorded the power of sustaining the cellular metabolism of all organs. The principal function of the pancreas and spleen lies in their production of a substance called "trypsin," which corresponds in a certain manner to the alexine of Buchner and the complement of Ehrlich. Answering to the immune body of Ehrlich is the "oxidizing substance," and this element, together with the trypsin and a third substance, the "fibrinogen," forms the immunizing or protecting bodies of the organism. Should one of these be absent or decreased the power of combating toxins is greatly injured. The author holds, further, that the leucocytes are of the utmost importance in carrying out certain metabolic processes and are themselves the purveyors of the "trypsin." The relation which these various organs bear to the life and functions of the body is expanded in detail throughout the different chapters, and many important experiments made by various investigators are quoted at some length to elucidate questions as they arise. Several excellent colored plates and black and white illustrations are used to explain the text. The book numbers about 800 pages and is well indexed.

W. T. L.

CLINICAL TREATISES ON THE PATHOLOGY AND THERAPY OF DISORDERS OF METABOLISM AND NUTRITION. By DR. CARL VON NOORDEN. Part III. Membranous Catarrh of the Intestines. New York: E. B. Treat & Co., 1903.

THIS monograph has been added to the series of clinical treatises on the Pathology and Therapy of Disorders of Metabolism and Nutrition, the American editions of which are translated under the direction of Boardman Reed, M.D.

This little book, after expressing the various views as to the pathology of colica mucosa, presents Prof. von Noorden's theory of the disease, which he speaks of as a symptom-complex. The position is taken that, although colica mucosa may complicate enteritis, it is not dependent upon any anatomical change in the mucosa, but is due to certain nervous influences which produce excessive irritability of the large intestine with overactivity of those glands that secrete mucus.

More than half the book is devoted to treatment. First the symptomatic and then the causal treatment on broad principles is thoroughly discussed. Diet regulations play the largest part, and Prof. von Noorden, assuming that the cure of colica mucosa presupposes a cure of the constipation which almost always precedes it, advises a system of feeding that is not directed to sparing the digestive organs, but that shall leave a coarse residue of such nature that the stools will be large and soft. He indicates the general lines to be followed in order to attain this result, and, even against his inclination, gives special lists. Such method of treatment, combined with measures to restore tone and balance to the nervous system, he believes, brings the quickest and most permanent cure. He calls his method a dietetic-exercise-treatment in contradistinction to the usual protective treatment. At the end of the book he presents a review of the cases treated in this manner. The book is a well-written and interesting contribution to the series. H. L. C.

A MANUAL OF BACTERIOLOGY. By ROBERT MUIR, M.D., and JAMES RITCHIE, M.D. American edition, with additions by NORMAN MACLEOD HARRIS, M.D. Illustrated. New York: The Macmillan Co., 1903.

THIS American edition of an English manual of such recognized value has given adequate expression to the researches of this country without in any way detracting from the original ideas of its authors. It is unquestionably the most trustworthy presentation of the subject in our language, presenting a comprehensive survey of the entire subject in its most modern aspects. The general morphology and biology of bacteria are first considered, and this is followed by descriptions of the cultivation of bacteria, technical methods of diagnosis, and animal inoculation. A chapter on the distribution of bacteria in air, soil, and water closes the more general section of the book. A chapter on the "Relations of Bacteria to Disease" introduces the subject of the individual species of bacteria causative of morbid processes, which naturally forms the bulk of the book. The treatment is one of pathological entities rather than the more biological grouping of the bacteria of allied species. Simple inflammatory suppurative conditions are first dealt with. In order follow gonorrhœa, soft sore, syphilis, tuberculosis, leprosy, glanders, and actinomycosis. Typhoid fever and its causative is considered in connection with allied organisms causative of paracolon infection and dysentery. Diphtheria, tetanus, and cholera are followed by influenza, plague, malta fever, and yellow fever. In connection with the latter disease the rather full treatment of the B. icteroides of Sanarelli may be criticised, since the probably parasitic nature of the disease, as shown by the researches of Reed and Carroll, although fully stated, is secondarily placed.

The concluding chapters on the general facts of active and passive immunity, together with an exposition of the more recent theories of Ehrlich and Metchnikoff, are most readable and interesting. Several appendices deal with smallpox, hydrophobia, malaria, and amœbic dysentery. A full bibliography completes the volume. The illustrations are sufficient and the general presentation pleasing. F. P. G.

PROGRESS

OF

MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

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Hypertrophic Tuberculosis of the Colon.—An interesting case of this remarkable condition is reported by Pennato (*La Riforma Medica*, 1903, xix., 491). The patient, a woman aged nineteen years, who had been subject to attacks of fainting, dyspnœa, and disturbances of digestion for some months, had had a cough without expectoration, and some enlargement of the lymphatic glands. With the beginning of a pregnancy these ills, which were very slight, became worse, and in addition there was a marked distention of the abdomen with indefinite abdominal pains, which were for the most part general, but especially localized in the cæcal region. There was vomiting and some diarrhœa. This became steadily worse until at the fourth month the abdomen was as distended as at full term, the dyspnœa intense, and the abdominal pain, especially on the right side, intolerable. There had never, apparently, been any fever. On entering the hospital there was marked dyspnœa; the lungs were clear. There was considerable ascites. The muscular resistance, owing to tenderness in the right side of the abdomen, prevented satisfactory palpation. The urine contained a slight trace of albumin and a few red blood corpuscles. No positive diagnosis was made, but owing to the condition of the patient a laparotomy was performed. The region of the colon was occupied by a diffuse swelling adherent to the vertebral column, which disappeared without precise limits toward the epigastrium. The uterus was evacuated, but after several hours the patient died in collapse. On autopsy the abdominal cavity contained a little turbid fluid. The visceral peritoneum was smooth throughout, but thickened and œdematous; the mesentery also was markedly thickened and smooth, while the epiploïc appendages were very large, and of a fatty, œdematous appearance. The cæcum and ascending colon were enlarged so as to form a voluminous tumor, the limits of

which were gradually lost in the transverse colon. The walls of the intestine were much thickened, of a lardaceous consistence, creaking on section, and remaining rigid so as to render it possible to distinguish on section the conspicuous thickening of the three coats of the intestine, surrounded by an enormous peritoneal thickening which made a sort of fatty sclerotic sheath. Corresponding to the ileocæcal valve there was a large ulcer, in part caseated, in part necrotic, which wholly encircled the lumen of the intestine, the base of which was rendered irregular by ridges, strands, vegetations, and warty and papilliform granulations. The diaphragm was considerably thickened by a rather soft, yellowish-white tissue, especially marked in the region of the costophrenic attachments, at which point the muscular substance was throughout replaced by this smooth tissue, which, macroscopically, seemed like an exudate infiltrated with fat, and reminded one of the fibrous tuberculous exudates in polyserositis. At no point were tubercles distinctly visible.

Although, macroscopically, no tubercles or caseous glands were to be seen, the appearance of the cæcal ulcerations and of the peritoneum suggested a sclerotic variety of tuberculosis, localized originally in the colon, with subsequent peritoneal diffusion. This was confirmed by the histological examination. Sections of the colon showed enormous hypertrophy of the walls, the mucosa measuring 1 mm., the submucosa and muscularis 3 mm., and the serosa 10 mm.

In the hypertrophic, glandular mucosa, as well as in the muscular coat, there were sclerotic changes, with diffuse, embryonal infiltration. This was richest in the subserous coat, and this thickening, which surrounded the intestine like a fatty, fibrous sheath, consisted completely of connective tissue fibres in the network of which there were to be seen only embryonal elements and fat. Characteristic tuberculous lesions were found only in occasional preparations of the intestinal wall—disseminated tubercles. In sections of the diaphragmatic peritoneum the hypertrophic fibrous tissue contained large areolæ infiltrated with small round cells, and this small-celled infiltration extended for a considerable distance between the muscular fibres, producing thus the marked thickening of the diaphragm, which was observed in gross. Other sections of the peritoneum showed similar changes.

The author regards the case as remarkable on account of its apyretic and relatively latent course. The primary area appears undoubtedly to have been in the cæcum and colon, from which it had gradually spread to the entire peritoneum, producing changes similar to those observed in chronic tuberculous polyserositis.

The importance of these cases of hypertrophic tuberculosis, occurring as they more commonly do in the cæcum and ascending colon, has been especially pointed out by Dieulafoy (*Clinique Médicale de l'Hôtel Dieu de Paris*, 1901–02, 8°, iv. 303). In some instances the condition has been relieved by operation and removal of the diseased part of the bowel. The symptoms in the beginning are commonly those of diarrhœa, abdominal pains localized in the iliac fossa, and of general gastro-intestinal disturbances, which may last for as much as a year without other manifestations, although later grave symptoms, for instance, of intestinal obstruction, may occur. In a good many cases a definite tumor in the ileocæcal region is to be found which is

especially likely to be confounded with malignant neoplasm or chronic appendicitis.

[The article of Dieulafoy (loc. cit.) contains an admirable discussion of this subject. The clinical picture of hypertrophic tuberculosis in this region is so definite that Dieulafoy considers it justifiable to speak of it as a clinical entity—"Hypertrophic Tuberculoma of the Cæcum."—W. S. T.]

An Analysis of Cases of Gastric Ulcer Occurring in the Royal Victoria Hospital during the Past Eight Years.—CANTLIE (*Montreal Medical Journal*, April, 1903, p. 255) reports that out of 20,596 cases admitted to the Royal Victoria Hospital during the last eight years, there were 85 cases of gastric ulcer, making a percentage of 0.004. There were 82 females and 3 males. The ages varied from seventeen to seventy, the average being twenty-seven and a half years. There were 8 cases under twenty years of age, and 10 over forty. The largest number occurred in the third decade. All perforations took place in this decade also. Thirty-four of the cases were servants, 14 were housekeepers, the remaining patients being distributed among a variety of occupations. In 3 cases the ulcer was attributed to trauma. The onset was manifested by pain in 78, by vomiting in 67, and by hematemesis in 45 cases. Anæmia was noted as an associated condition in 42 cases. Perforation occurred in 8 cases. With one exception these were all admitted after complication had developed. The surgical treatment was remarkably successful, 7 of the 8 cases recovering. Two patients out of the 85 died: one of perforation and general peritonitis, the other from hemorrhage.

Eating of Unwholesome Fish as a Cause of Leprosy.—For a number of years Mr. Jonathan Hutchinson has been very skeptical as to the contagiousness of leprosy, and has been the leading champion of the theory that the disease is propagated by the eating of badly cured fish. In order to accumulate evidence in support of his theory he visited South Africa and India during the past winter. In a series of editorials and brief reports (*The Polyclinic*, June, 1903) Mr. Hutchinson shows that he is even more firmly convinced of the correctness of his theory. He claims to have shown that in both South Africa and India the disease was practically confined to the coast before transportation facilities permitted the easy conveyance of poorly preserved fish into the interior. He found the strongest argument in favor of his theory in India. In the Tantaran Asylum, one of the lazarettos in the Punjab, there were, last February, 54 Hindus, 53 Mohammedans, and 34 native Christians. The total Hindu population of the Punjab is little short of 13,000,000, the Mohammedans being about 14,000,000. The Christians, however, amount to only 72,000, and the native Christians, from whom the leper population was solely derived, to only 36,000. Adding together the Hindu and the Mohammedan population there is a total of 27,000,000, and these supply 107 lepers, whereas the native Christians have the insignificant total of 38,000, and yet supply 34. If the adherents of the three religions were equally susceptible, the native Christians should have supplied only 3.

Mr. Hutchinson attributes this greater prevalence of leprosy among the

native Christians to the fact that their change in religious belief removes the race prejudices against eating fish, while in the case of the Roman Catholics it is substituted by a sort of compulsion to eat it. He believes that this proportion exists also in the other lazarettos in the Punjab. From his observations he states that it is probable that the prevalence of leprosy among the native Christians is not less than 30 or 40 per 10,000, as contrasted with 1.8 in the general community, which includes the Christians, and is very much augmented by them.

Mr. Hutchinson believes that the prevalence of leprosy in India would be much lessened by the removal of the very high duty on salt. He holds that with the removal of this duty the fish would be much better cured, and far less unwholesome fish would be placed on the market.

A Contribution to the Study of the Achilles-jerk and the Front-tap.—WALTON and PAUL (*Journal of Nervous and Mental Disease*, June, 1903, p. 342) have made a careful study of these two reflexes in health and in various diseases. In testing for the Achilles-jerk they rather prefer the position with the patient kneeling in a chair. The front-tap is elicited by smartly tapping the tibialis anticus with a Taylor rubber hammer, less advantageously by the finger, the examiners meantime flexing the foot dorsally, and holding it in this position: the ankle resting on the knee of the examiner or on the edge of a stool. The reflex consists in plantar flexion of the foot. The conclusions come to by the writers are as follows:

1. The Achilles-jerk is practically as constant in health as the knee-jerk. This reflex varies less in health than the knee-jerk in excursion and activity, and is the most easily elicited and uniform of all tendon reflexes.

2. The Achilles-jerk disappears, as a rule, early in tabes dorsalis, and its absence is as diagnostic of that disease as is loss of the knee-jerk. We have not seen a case far enough advanced to establish tabes with persistence of the Achilles-jerk, except one case in which both the knee-jerk and the Achilles-jerk were present on one side only. We have observed bilateral preservation of the knee-jerk and loss of Achilles-jerk in two out of five cases of tabes.

3. Enfeeblement of knee-jerk in health on one side or both may be due to prior toxic influence, as diphtheria. This may also be true of the Achilles-jerk, though in one case in which it could be demonstrated of the knee-jerk, the Achilles-jerk was normal. Further observations on this point are desirable.

4. The front-tap is present (generally on both sides) in about 40 per cent. of individuals in ordinary health; in some it is very active. It follows that its presence alone, even if active, does not establish disease, nor indicate excessive irritability of the nervous system.

5. In organic disease the front-tap is generally increased with the other reflexes in hypertonic, and decreased (generally wanting) in hypotonic states.

6. In the so-called functional disorders, hysteria, neurasthenia, and unclassified psychoses, we have found the front-tap present in 71 per cent. In epilepsy we have found it present in 75 per cent. of cases. The test may therefore here prove of aid in combination with other findings, though its mere presence, or even activity, is not of positive diagnostic value; nor does its absence negative the existence of neuropathic conditions.

7. Both these reflexes deserve to be placed upon the list of routine tests for purposes of diagnosis. This is particularly true of the Achilles reflex, which is of the greater positive diagnostic value.

SURGERY.

UNDER THE CHARGE OF

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A Case of Tetanus Treated with Antitetanic Serum; Recovery.—WYNTER (*Lancet*, November 15, 1902) reports the case of a man, aged forty years, who ran a rusty nail into the ball of his left foot, which was followed by the development of tetanus ten days later. The convulsions recurred during twenty-seven days, and forty-five days elapsed between the injury and complete convalescence. Fever was noted for fourteen days, the highest temperature being 102.6° F. on the eighth day from the appearance of symptoms. Antitetanic serum was given in doses of ten cubic centimetres every six hours for sixty doses until the convulsions subsided. Extract of physostigma was also administered in half-grain doses every six hours, and only omitted when all rigidity had gone. Morphine was relied upon to relieve the pain and to induce sleep during the acute period, but two grains a day were never exceeded. Applications of hot water certainly relieved local spasm, and evacuation of the bowels was always attended with benefit.

That this was a genuine case of tetanus was amply proved by the onset and course of the symptoms. Though severe, it was not of the acute type, which proves fatal within two or three days, and there was an absence of prolonged spasm or fixation of the respiratory muscles or glottis, such as proved fatal in other cases. How far the remedies, applied early and persistently, modified the development it is difficult to say, though the relief afforded by hot applications and morphine was immediate and undoubted.

The Surgical Treatment of Anuria.—BEVAN (*Annals of Surgery*, April, 1903), after reporting a successful operation for a case of obstructive anuria, states that total suppression of urine occurs:

1. From mechanical obstruction of the ureter of the single functionating kidney of an individual, the other kidney either being congenitally absent or destroyed by previous disease.

2. From mechanical obstruction of one ureter in an individual possessing two functionating kidneys, with increased intrarenal pressure on the

obstructed side, which by reflex nerve action prevents the unobstructed kidney from functionating—the so-called reflex anuria; or, possibly, after a nephrectomy, the involvement of the nerves in the pedicle may produce a reflex anuria.

3. From trauma of both kidneys, which, for a time or until fatal issue, is followed by complete cessation of function; also from trauma of a single kidney, which apparently by reflex action so affects the uninjured kidney that complete anuria results.

4. From acute nephritis, as sometimes seen in scarlet fever and other forms of septicæmia.

5. From destruction of practically all kidney tissue as the result of such chronic lesions as tuberculosis, cystic degeneration, etc.

6. From certain poisons, as phosphorus, lead and turpentine, ether, chloroform, etc.

7. From the peculiar condition known as urethral fever, commonly the result of the passage of a catheter or sound.

8. In the polymorphous symptom-complex known as hysteria, anuria may occur.

After classifying clinically the various causes under the three general headings of obstructive, reflex or paralytic, and non-obstructive or nephritic, and discussing each in detail, the author states, in conclusion:

1. The clinical importance of recognizing the three forms of anuria—obstructive, reflex, and non-obstructive—is to be emphasized.

2. The imperative necessity of surgical interference in the obstructive and reflex forms, and its possible value in the non-obstructive cases.

3. That in the first two varieties, at least, a rapid nephrotomy on the side of pain, tenderness, and muscular rigidity is the operation of choice. If necessary, do not hesitate to make a double nephrotomy.

4. That nitrous oxide anæsthesia is probably to be preferred.

5. That time-consuming operations to relieve permanently the obstruction are to be postponed to a later period, after the patient has recovered from the anuria.

6. Operate early, by the beginning of the third day.

Results of Decapsulation of the Kidney.—JOHNSON (*Annals of Surgery*, April, 1903), after an exhaustive series of experimentation on dogs, gives the following summary of findings:

1. The capsule of the normal kidney consists of two distinct layers, the outer being much thicker, while the inner is very thin, the direct continuation of the intertubular connective tissue.

2. In the operation of decapsulation the outer layer only is removed, leaving the inner lacerated but adherent to the kidney's surface.

3 At first a thin exudate appears on the free surface of the kidney, which, with the remains of the inner layer, gradually becomes a fibrous investment, resembling macroscopically the normal capsule in that it strips readily, and with the passage of time it becomes more and more firm.

4. Microscopic examination reveals the fact that it is in some cases thicker and in others thinner than the original, the former generally being true, and that in most instances it varies greatly in thickness in the same specimen.

5. The structure, at least up to three and a half months, does not become differentiated into layers, but is one homogeneous mass of fibrous tissue.

6. One case revealed the fact that it will form under adhesions, and is to be recognized as distinct from them both microscopically and macroscopically.

7. There is sometimes an infiltration with round cells and a proliferation of the intertubular connective tissue of the cortex, without, however, affecting the glomeruli. The dogs in whom these changes were noted remained perfectly well as far as could be shown by their appetite, strength, and playfulness.

8. Most important is the fact that in no case was there any considerable anastomosis between the renal and perirenal blood channels. In one case, at the same time decapsulation of one kidney was performed, the renal artery of the other was ligated. This would, presumably, call for increased activity in the circulation of the decapsulated kidney. It was all, however, made up by the increased size of the renal artery and vein, and not through a peripheral anastomosis.

Conclusions: There are many difficulties in the way of drawing inferences as to the value of this measure as a curative or a palliative one in chronic glomerulo-nephritis. The chief one is that it has, up to the present time, been found impossible to give a dog an interstitial glomerulo-nephritis.

Edebohls draws these conclusions from his operations on patients suffering from chronic Bright's disease in which the method of decapsulation has been employed:

1. That chronic Bright's disease can be cured by decapsulation of the kidneys in a large percentage of cases.

2. That the cause of the cure lies probably in the establishment of a collateral circulation between the bloodvessels in the adhesions and those of the kidney.

Schmitt, in a very able review of the clinical evidence (*New York Medical Record*, September 13, 1902), raises the following points in objection to Edebohls' first conclusion:

1. Included in Edebohls' cases are some operated upon for movable kidney in which chronic nephritis was diagnosed, and that as a movable kidney by tension on the vessels may become congested, the presence of casts and other alterations of the urine found in chronic Bright's disease is not unusual.

2. That in most of the other cases a sufficient length of time had not elapsed to make the claim of the cure of the disease a justifiable one.

3. That in a large proportion of his cases Edebohls claims that one kidney alone was affected; whereas Kummel and Strauss have found that it is bilateral in every case of Bright's disease examined by them, basing their conclusions on ureteral catheterization.

4. That in Edebohls' case, and two reported by Ferguson where a small portion of the cortex was removed for examination, the section of tissue taken was not sufficiently comprehensive to allow of a positive diagnosis.

Israel and Pousson believes that the benefits sometimes derived from this operation are due to relief of tension rather than to the establishment of a collateral circulation, as Edebohls has stated.

Pousson, from twenty-three cases by different surgeons, concludes that nephrotomy or nephrectomy may be indicated (*a*) in chronic nephritis complicated with hæmaturia; (*b*) with nephralgia; (*c*) in subacute infectious nephritis, under this head classifying the cases of Harrison; (*d*) in acute infectious nephritis. Miliary abscesses of a kidney and movable kidneys with pyelonephritis are included in this division. Pousson believes that there is a sympathetic relation between the kidneys as between the eyes, and that an operation upon one will frequently relieve the condition existing in the other. He uses protracted drainage in all his cases.

Harrison employs renipuncture or division of the capsule, and gives the following indications for its use:

1. Suppression of urine with alarming symptoms in scarlatinal nephritis.
2. Progressive signs of kidney degeneration, as shown by the persistence or increase of albumin.
3. Where a marked disturbance of the heart and circulatory apparatus arises in the course of inflammatory renal disorders.

The second conclusion of Edebohls, namely, that the improvement is due to the formation of new bloodvessels which anastomose with those of the kidney, has so far not been confirmed by evidence from the autopsy table. Furthermore, it has been shown that added demands on the circulation of one kidney caused by the removal of the other, either with or without decapsulation of the first, does not in the dog produce an increased vascularity of the perirenal tissues.

Note on the Frequent Great Disparity Between Falls upon the Buttocks and the Subsequent Persistent Pain and Irremediable Helplessness in Persons in Advanced Years.—ALLIS (*Annals of Surgery*, March, 1903) states, after reporting seven cases, that the different results from trifling injuries must be due to very different conditions present. These may be considered under the following heads: First, osteophytes may spring up about the injured joint, or fragments of bone from the original injury may become fixed like stalactites and pierce the tissues. Second, the fall may in one instance produce concussion of the joint. Experimental work has shown that when great pressure has been exerted against an articulation in some instances the cartilage has been depressed, cracked, and distinctly broken. Although in fractures of the femoral neck the yielding of the bone under comparatively slight injury would preclude a concussion or severe injury to the joint, yet in autopsies after years of suffering there has been found evidence of a mild subacute arthritis that accounted fully for the pain. In one instance in which the author operated five years after a fracture of the femoral neck there was no evidence of active degeneration of the articulation, but the head and socket both showed large areas of absorbed cartilage and denuded bone. Third, the sciatic nerve may at times be pinched or torn, but the author knows of no facts to warrant this statement. There are facts that show that this nerve is injured by dislocations. Autopsies show that blood has been effused into the sheath of this nerve, and the same has been lacerated and torn in two. It is also known that paralysis has followed either injury to the nerve from dislocation or from injury in attempts at replacement. In one case of a comparatively slight fall backward the patient ex-

perienced no great pain, and was able to get up and go into her kitchen. The pain arose while she was in a sitting position, and soon became so violent that she could not move the limb without pain. An examination under ether revealed no bone lesion, and the conjecture was that the sciatic had been bruised. Fourth, the ligamentum teres may be torn. The author has no positive evidence of this, but in one autopsy to examine a fractured hip it was either congenitally absent or absorbed. In experiments the ligamentum teres has been torn without dislocating the head of the femur. In regard to treatment the author states that he has little to offer. In one case he removed the fragment of the head of the femur five and a half years after the injury, because the patient had suffered pain night and day all these years, and could endure it no longer. As the patient was sixty years old, with atheromatous arteries, the fact that no brilliant result followed may not be wholly attributed to the operation. If an operation be undertaken it is reasonable to think that it should be indicated by the persistency of pain—after one or two months. There are few surgeons who would think of removing the fragment of a broken femoral head and neck without first seeing what effect treatment would bring about; but after one or two months of continuous pain surgical interference is warranted, provided the patient's age and strength will permit.

THERAPEUTICS

UNDER THE CHARGE OF

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Treatment of Epilepsy.—DRS. VICTOR HORSLEY and RISIEN RUSSELL, in a paper recently read before the Medical Society of London, spoke on the treatment of idiopathic epilepsy. They had tried serum obtained from a patient with severe epilepsy which they had injected into another patient with a milder form of the affection but this gave no results. The use of filtered cultures of streptococci and staphylococci, the toxin of erysipelas and antitoxin had been tried, but were of no service. The bromides were still the most potent agents in the treatment of idiopathic conditions, but they must be given boldly and in large doses if they are to be of any service. Most of the ill effects of the bromine might be avoided if the drug were given more freely in the early stages of the disease. They use potassium salts alone, not having found any special advantage by giving the mixed bromides. Whichever of the salts is used, a single dose is best given an hour before bedtime in nocturnal epilepsy and two hours before the time of

the occurrence of the attack if there is a well-marked rhythm. Morphine hypodermically, they thought, was one of the best drugs for the status, but the risks were great, and they rely more on large doses of chloral given by the rectum. Bromidin had been extensively used and had been favorably received. Tea and coffee should be excluded from the diet and a small amount of meat permitted. The exclusion of common salt from the dietary was spoken of and commended.—*Lancet*, 1903, vol. clxiv. p. 439.

Calcium Salts in Uric Acid Calculi.—Dr. A. C. Croftan comes to the following conclusions regarding the relation of calcium salts to the formation of kidney calculi of uric acid: (1) Uric acid in the urine is held in solution by the di-sodium phosphate, and is precipitated by the monosodium phosphate. (2) For the prevention of uric acid calculi the increase of di-phosphates and the increase of monophosphates is therefore desirable. This can be accomplished either by increasing the sodium of urine or decreasing the sodium of phosphatic acid. (3) Calcium salts administered internally produce the desired effect by decreasing the excretions of phosphoric acid in the kidneys in the following ways: (*a*) by binding the phosphates of the food and preventing their absorption, (*b*) and by binding the phosphates of the blood and causing their elimination through the bowels. (4) The administration of sodium salts that can also produce an increase of the di-phosphates, and a relative decrease of the monophosphates, is to be condemned mainly because large doses render the urine alkaline.—*Journal of the American Medical Association*, 1903, vol. xl. p. 818.

The Treatment of Influenza.—Dr. Robert H. Babcock states that there is no specific remedy for influenza; therefore, treatment should be preventive and symptomatic. The former should include such measures as are calculated to protect friends and attendants from infection, as well as to guard the patient from secondary infections. Isolation, therefore, is advisable; artificial heat and suitable screens are serviceable; fresh air is imperative. The sputum should be destroyed, preferably by corrosive sublimate, and special care should be given to the disinfection of handkerchiefs. To guard the patient from complications, rest in bed is imperative, since pneumonia is so common following grippous colds. Direct treatment by inhalations of steam impregnated with antiseptics is serviceable. Heroine and codeine, or even morphine, are advised for the cough. Phenacetin in combination with quinine, he believes, is very valuable, both as an analgesic and antipyretic. The fever rarely requires any treatment. Aconite may be of service; calomel and salines are useful in the beginning. He believes in small amounts of alcoholic stimulants, which are best combined with milk and eggs. Convalescence is hastened by the use of glycerophosphites, hypophosphites, and organic iron preparations.—*Chicago Medical Record*, 1903, No. 3, p. 260.

Chlorodyne Poisoning.—Dr. K. R. Dalal describes a case of poisoning with this proprietary preparation. The patient, a boy eighteen years of age, was found one morning lying unconscious in his bed, drenched with a profuse perspiration. The whole body was cold to the touch; the pulse was imperceptible at the wrist, the breathing embarrassed, the respirations being

shallow and quick. The heart sounds were found to be very feeble and fluttering, without any rhythm. The pupils were equally regular, in a state of moderate contraction, and responded to light. The tongue was dry, white, and shrivelled. Injections of ether were given, plus tincture of digitalis. Mustard plasters were applied to the nape of the neck and over the cardiac region, and fomentations of hot carum ajowan seeds were applied all over the body. Under the effects of the ether, the digitalis, and hot coffee, eight ounces of which were given by rectum, the pulse became full, of fair tension, and 100 to the minute. Coffee and brandy were freely given, and consciousness slowly returned. The patient, however, was very drowsy, as if he had taken some narcotic. At least two and one-half drachms of chlorodyne were taken, and on the label attached to the phial the only statement given about the constituent parts was that it contained one-eighth of a grain of morphine in thirty minims. No statement as to the amount of hydrocyanic acid contained was given.—*British Medical Journal*, 1903, No. 2211, p. 1142.

Acute Alcoholic Poisoning Treated by Saline Injection.—Dr. F. C. Forster was called to treat a boy, four years of age, who had swallowed two ounces of clear whiskey. This was taken about 8 A.M. on an empty stomach. At 8.45 he was lying insensible on a sofa. His temperature was 97° F., his skin cold and clammy, the respirations shallow and sighing, and the pulse irregular and uncountable, his general condition being one of profound collapse. The corneal reflex was absent, the pupils being dilated and slowly reacting to light. He was given strychnine, and the stomach was siphoned out. He was wrapped in blankets and hot bottles, but remained comatose, and improvement was very slow, if there was any. Warm saline injections per rectum were then given, and after a pint had been retained the patient slowly rallied from his collapse, so that half an hour later he was able to take some hot beef-tea by the mouth. From this stage the recovery was rapid, and next day he was playing as usual.—*British Medical Journal*, 1903, No. 2211, p. 1142.

The Kenyah Dart Poison and its Active Principle, Antiarin.—Dr. C. G. Seligmann presents the results of a research, for which a prize has been given by the British Medical Association, on the physiological action of the poison made from the crude sap of *antiaris toxicaria*, which, when inspissated, is used to poison the blow darts of the savages. The poison is called ipoh by the natives, and watery solutions of this have no effect on fish and small fresh-water crustaceæ. Frogs show a marked reaction to it when injected subcutaneously. There is inco-ordination, with inability to maintain their position on an inclined plane; clonic convulsions, especially of the arms and legs; slow respiration, and, finally, complete paralysis of the limbs and the trunk, with systolic arrest of the ventricle. The heart-beats become slower, the auricles usually beating slowly and firmly until the ventricle stops in systole. The auricular beats then become slower, slighter, and more irregular until the auricles stop in diastole. In mammals there are short, convulsive movements and conspicuous gastrointestinal symptoms. Defecation is excessive, the stools being loose and watery. At the post-mortem examination the heart is found arrested in diastole; very rarely the ven-

tricles are in systole and distended with blood. Birds are susceptible to ipoh, death being, as a rule, very sudden. There is a partial slight paralysis, which rapidly becomes a complete paralysis, and the animal falls down, and after a few convulsive struggles expires. The conclusions that the author draws are (1) that it acts on the ventricle of the heart as a poison of the digitalis group, a result which has been noted by all observers working with the juice of *antiaris toxicaria*. (2) It causes paralysis of the central nerve system. (3) It causes clonic spasms of the voluntary muscles.—*British Medical Journal*, 1903, No. 2211, p. 1121.

Poisoning by Datura.—Dr. John D. Gimlette states that there are a number of species of datura occurring in the Malay Peninsula, and that poisoning from these different species, datura fastuosa, datura alba, and datura stramonium, is very common. The Malays mix the leaves with urine or powdered rice and saffron, and apply them externally for various pains and swellings. They also heat the leaves over a torch until smoked, and then apply them as a poultice over the spleen in intermittent fever. The flowers are dried and roughly powdered with or without the leaves and rolled into cigarettes for the relief of asthma. They prize the drug very much, and very frequently use it as a poultice to relieve the pain of boils, carbuncles, hemorrhoids, and mix it with butter in the treatment of facial neuralgia and dog bites. The symptoms of the poisoning are well known. The treatment that they employ there is washing the stomach, active purgation, use of tannic acid as in tea, use of opium, and potassium permanganate.—*British Medical Journal*, 1903, No. 2211, p. 1137.

Morphine in Uræmic Convulsions.—Dr. Hobart A. Hare publishes a symposium of opinions which he invited from well-known physicians concerning their experience in the use of morphine in uræmic convulsions, to see whether or not their results bear out the general plan of treatment indicated by Loomis, viz., the use of morphine in the uræmia of acute nephritis and not in the uræmia arising from chronic renal changes. Dr. James Tyson states that Loomis had personally advised him that the hypodermic injection of morphine was beneficial only in cases of uræmia from acute parenchymatous nephritis, whether due to pregnancy or other causes, and that he himself has found it to be harmful in uræmia due to chronic interstitial nephritis, as it deepens the coma and makes relief more difficult. Owing to the difficulty of diagnosis between the two conditions he is chary of the use of morphine in any case of uræmia.

Dr. H. Hale White prefers to control the convulsions with chloroform, feeling that morphine should only be used in some cases where all other remedies have failed, for he believes that patients with Bright's disease are in rare instances fatally poisoned with morphine.

Dr. William Ewart states that while he would not hesitate to use a hypodermic injection of morphine in cases where he could not immediately resort to chloroform inhalation, or where the latter had failed, yet as a method of treatment, except in very small and carefully watched doses, he is averse to it, for he traces good effects to direct elimination, which the continued use of morphine would directly retard.

Dr. Frank Billings thinks that morphine administered hypodermically is of great value in cases of uræmic convulsions, in which there is a dilatation of the heart with vasomotor stasis, and a tendency to œdema of the lungs. The dose, however, he holds should not be more than one-eighth grain, administered and repeated in not less than one hour. In such cases he gives strychnine with the morphine. In uræmic convulsions with high-tension pulse and without breaking down of the cardiovascular integrity he thinks morphine uncalled for.

Dr. John H. Musser writes that he has had such excellent results from the use of morphine in respiratory forms of uræmia, as uræmic asthma, that he feels it would be the greatest advantage in some cases, in which convulsions are the most pronounced symptom. He has used it successfully in two non-dropsical cases of chronic nephritis to control the restlessness after the convulsions, and thinks that it prevented a recurrence.

Dr. James M. Anders says that morphine administered hypodermically is less harmful in its effects in acute nephritis than in the chronic, more particularly in the cirrhotic, form of the disease. He finds that it has always afforded prompt relief from the convulsive seizure. He questions, however, whether morphine does not favor the retention of waste products of metabolism within the system. Practically, however, he has always had good effects from the subcutaneous use of morphine in the convulsions of acute nephritis and puerperal eclampsia. In chronic nephritis, however, he employs other remedies, especially chloroform, chloral, bromides, and venesection, though occasionally when these fail he has employed a single dose of morphine. In all other uræmic manifestations morphine should be withheld, since it favors the development of uræmic poisoning.—*Therapeutic Gazette*, 1903, vol. xxvii. p. 1.

PEDIATRICS.

UNDER THE CHARGE OF

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The Value of Diphtheria Antitoxin.—Fussell (*Philadelphia Medical Journal*, October 25, 1902), in an article on the value of diphtheria antitoxin, emphasizes the importance of its early use in every case of clinical diphtheria or suspicious sore-throat.

That there are many men who are still unbelievers in the efficacy of this remedy he attributes to two causes:

First, because very many of the mild and moderately severe cases are not reported in certain of the large cities in order to prevent the house from

being placarded. This results in an apparent mortality rate of from 25 to 30 per cent., a figure very little, if any, less than that which existed before the introduction of antitoxin.

Second, the fact that physicians who only occasionally use antitoxin administer it in small doses or too late in the course of the disease.

The writer gives the notes of cases occurring in his own practice before the introduction of antitoxin, showing the uncertainty of treatment at that time. He compares this with the specific action of antitoxin and the consequent reduction of the mortality rate which he has observed in his own experience under its use.

In conclusion he gives the following rules, which should be observed in every case:

A culture should always be made in throat cases.

Give antitoxin at the time of making culture.

Give 2000 units, and if there is no improvement in six hours, repeat the dose. Every twelve hours thereafter administer 2000 units until improvement begins.

The Arthrites of Scarlatina.—SZONTAGH (*Jahrbuch f. Kinderheilkunde*, 1902, Band v., S. 702) records fifteen observations of scarlatinal arthritis. Except in two cases, joint manifestations did not occur before the fourth week, several times five, six, or even seven weeks intervening after the onset of the scarlatinal attack.

In six cases a single articulation was affected; in four, two joints; in four, three; and once, four. The articulations of the left side were involved twice as frequently as those of the right side. The joints affected were the ankle in seven, the wrist in six, the carpo-metacarpal joint of the index finger in six, the knee in five, the shoulder in two, the elbow in two, the hip in one, and once the sternoclavicular articulation.

In all these cases there was at the same time a nephritis, and in the majority this was quite grave. In thirteen of the cases the nephritis had preceded the joint symptoms; in one case renal and articular manifestations appeared simultaneously; and in one arthritis developed first. In the author's opinion there existed a sort of connection between the nephritis and the arthritis, in several cases the appearance of uræmia apparently being prevented by the development of joint symptoms.

The author considers the joint involvement not as a secondary infection, but as a localization of the scarlatinal poison. True scarlatinal rheumatism, therefore, is not attended with suppuration. If suppuration occur it should be regarded as an expression of a general pyæmia, and not as a specific manifestation of scarlet fever.

Cream for the Home Modification of Milk.—CHARLES W. TOWNSEND (*Boston Medical and Surgical Journal*, April 16, 1903, p. 414) discusses the accuracy of results obtained in securing creams for modification by the several methods in vogue. These are: (1) Cream by the centrifugal process; (2) gravity cream or top-milk obtained by siphonage; (3) gravity cream obtained by dipping off the top; and (4) gravity cream obtained by pouring off the top.

1. In nine specimens of centrifugal creams of stated definite percentage only one showed a percentage corresponding in the integer with the stated strength; and with the exception of one 10 per cent. cream, which showed 15 per cent. of fat, the other seven specimens contained from 1 to 3.5 per cent. less fat than the label indicated for those of 20 per cent. or less, and 4 7 to 5.7 per cent. less in those labelled 40 per cent.

2. The method by siphoning requires considerable skill and practice, and cannot be performed satisfactorily by an untrained hand. As to accuracy, the author has found that if the flow is stopped at exactly the right moment, the analyses obtained from different bottles of the same milk vary but little. Thus the analyses of the cream obtained by siphonage from two bottles of the same milk (upper eight ounces) were 13.5 per cent. and 13.7 per cent., and in another case 12.9 per cent. and 12.5 per cent

3. With Chapin's dipper it was found that a considerable variation could be obtained, depending on the care with which the dipper was lowered into the bottle. Thus the upper eight ounces dipped off with great care in one case showed 14.2 per cent. of fat; the same quantity dipped carelessly from another bottle, though measured accurately, showed 13.6 per cent. In another case the analyses were 16.1 per cent. and 14.3 per cent. This variation is not great and can be avoided by taking pains to lower the dipper slowly as it fills.

4. With the method by pouring off the cream the author has had excellent results. Whether poured off slowly and carefully or hurriedly and carelessly, provided the amount poured off is accurately measured to a given mark in a graduated glass, his results have been almost identical; in one case both samples gave an analyses of 10.6 per cent., and at another time 10.1 and 10.2 per cent. In all these cases the milk had stood eight hours. If the milk comes from the same dairy and is honestly handled, Townsend states that surprisingly little variation is noticed from day to day. In twenty-eight examinations made of the upper eight ounces poured from the quart in July, August, September, and October—months when considerable variation takes place in the food of the cows—the average analysis was 10.8 per cent., with an extreme variation from 9.8 per cent. to 11.9 per cent. This was milk from a herd of eighty or ninety cows, kept under model conditions. By this method the average percentage of the upper eight ounces was 2 or 3 per cent. lower than that obtained by the Chapin dipper or the siphon.

By pouring off from the quart, after standing eight hours, the upper three ounces, a 22 per cent. cream is obtained; the upper six ounces gives a 14 per cent. cream; the upper eight ounces, a 10 per cent. cream; the upper twelve ounces, an 8 per cent. cream, and the upper sixteen ounces, a 6 per cent. cream.

Variations in the Composition of Human Milk.—PHILIP P. SHARPLES and EUGENE A. DARLING (*Boston Medical and Surgical Journal*, April 16, 1903, p. 416) give the results of analyses of 117 samples of human milk from eights patients of varying ages, the number of lactations of the different mothers including the first in four cases, the second in two, the seventh in one, and the thirteenth in one. Not less than eight examinations were made in any case, the general average of the series being about sixteen. The

average composition shown in this series was: fat, 2.91 per cent.; sugar, 7.01 per cent.; proteids, 1.34 per cent.; ash, 0.13 per cent.; total solids, 11.39 per cent.; and solids not fat, 8.48 per cent. Comparison of results demonstrated, as is well known, that there are wide variations from the average in milk from the same individual at different times; that there are marked variations in the average composition of milk from different individuals; and that the average composition of human milk does not vary to any marked extent at different periods of lactation. During the first lactation the milk, on the average, is weaker in fat and proteids, but stronger in sugar than in subsequent lactations. These differences may or may not be due to age.

Note on the Employment of Epicarin in Tinea Tonsurans and Tinea Circinata.—ARTHUR VAN HARLINGEN and HENRY K. DILLARD, JR. (*Transactions of the Philadelphia Pediatric Society*, February 10, 1903) report their experience with epicarin as a topical application in ringworm from their service at the Children's Hospital. The drug is said to be a condensation product of creotinic or creosotinic acid and naphtol, and to possess the properties of creosote and naphtol. In ringworm of the scalp it appears to have a decided value on account of its high penetrating power when in alcoholic solution. In cases of ringworm of the body and of scabies epicarin seems to be too irritating for satisfactory use.

The Nature and Treatment of Recurrent Vomiting.—DAVID L. EDSALL (*Transactions of the Philadelphia Pediatric Society*, February 10, 1903), referring to the fact that the nature of this condition has not been satisfactorily explained and that the treatment has been unsatisfactory, reports observations in six cases, showing that a severe acid intoxication of the type seen in diabetes mellitus was presented. Treatment directed toward this acid intoxication was strikingly successful in all but one of the cases, and in this exceptional case the result was still in doubt. He advises the use of rapidly repeated large doses of a diffusible alkali, preferably the bicarbonate of sodium. This treatment should be instituted immediately upon the onset of an attack, or, better, as soon as any prodromes of an attack are observed.

The Action of Vaccination upon Pertussis.—POCHON (*Revue Mensuelle des Maladies de l'Enfance*, March, 1903, p. 102) reports the effects of vaccination upon the course of a severe attack of pertussis in an infant, aged five months. The inoculation was made on the eighth day of the convulsive stage of the disease, at a time when the infant was severely ill. The rectal temperature was 99.5° F., and the paroxysms occurred every half-hour, sometimes even more frequently. From the moment of the development of the vaccine vesicle the paroxysms became less frequent until the vesicle was well matured, and then, though somewhat more frequent again, became much less severe in character. Two weeks after the vaccination was performed the child was practically well.

Pochon believes that the case quoted is most conclusive of the beneficial action of vaccinia in pertussis. At the time the operation was made the condition of the infant could scarcely have been worse; the amelioration in the gravity of the pertussis was extremely rapid. He therefore believes that

vaccination should always be made in the case of an unvaccinated child suffering from pertussis; and that revaccination should be practised in other cases, on the chance that the system of the child may still be capable of reacting to the virus.

Methylene Blue in Chronic Suppurating Otitis Media.—GAUDIER (*Revue Mensuelle des Maladies de l'Enfance*, March, 1903, p. 141) speaks highly of the value of instillations of a warm solution of methylene blue (1:500) in the treatment of certain forms of chronic suppurative otitis media and, in particular, in the fetid otorrhœas of childhood, which are so rebellious to treatment by the usual antiseptics.

After syringing out the external auditory canal and the tympanic cavity with warm, soapy water, fifteen to twenty drops of the methylene blue solution are slowly instilled into the ear. This procedure should last about five minutes, during which the patient should practise Valsalva inflation two or three times, in order to draw the solution into the tympanic cavity.

Gaudier has employed this method, in association with treatment of the primary rhinopharyngeal affection, in nine cases of long-standing otitis with large perforations and very profuse and fetid discharge. In seven of these cases complete cure was effected in twenty-five to thirty days; one passed from observation, and in the last case the treatment had to be suspended on account of the appearance of mastoid trouble. To insure a permanence of the cure it is well to continue the treat for several days after the disappearance of the discharge.

Kernig's Sign in Typhoid Fever in Children.—CARRIÈRE (*Le Nord Médical*, February 15, 1903, p. 45) has made a systematic search for Kernig's sign in 50 cases of typhoid fever occurring in his service. Out of this number the reaction was noted in 22 cases; in 15 very clearly, in 7 slightly. He therefore concludes that in something less than half of the cases (44 per cent. in his own series) this symptom is observable.

In all the cases in which the sign was noted cytoscopic examination of the cerebrospinal fluid was made. Once only was a slight polynucleosis found. In all the other cases the liquid contained no cellular elements. Cultures remained sterile. The presence of Kernig's sign is therefore not sufficient to prove the existence of spinal meningitis in typhoid fever.

This phenomenon was noted in normal forms of the disease without the ataxic state, as well as in the ataxic forms, and exceptionally in the adynamic forms.

In general the sign was observed from the third to the sixteenth day of the disease; exceptionally after or before these limits. While usually disappearing about the thirteenth or fourteenth day, it may reappear or even appear for the first time at the development of a complication.

While the Kernig sign in this series of cases of typhoid was not necessarily of fatal prognosis, it is interesting to note that all the fatal cases were included in the number which showed the sign. It therefore seems proven that Kernig's sign cannot serve as a means of distinguishing typhoid fever in the child from cerebrospinal meningitis, tuberculous meningitis, or meningeal accidents of other nature.

OBSTETRICS.

UNDER THE CHARGE OF

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Asphyxia from Enlarged Thyroid.—In the *British Medical Journal*, June 6, 1903, MACDONALD reports the case of an infant suffering at birth from profound asphyxia, which passed off under treatment by rhythmic traction on the tongue and other methods. On examination it was found that both lobes of the thyroid were enlarged, each the size of a large marble, while the isthmus was the size of an adult little finger. As respiration was difficult, tracheotomy was attempted. The congestion of veins surrounding the thyroid was so great that it was impossible to reach the trachea below the isthmus. The child died while the isthmus was ligated and divided.

Labor occurred at eight months, and polyhydramnios was present. Extension of the head was limited by the tightness of the skin over the swelling.

The mother had two children, each born at about eight months. There was no history of syphilis. From the second month until labor she had taken chlorate of potassium and iron to prevent a miscarriage.

Fracture of the Clavicle in the Fœtus Occurring after Spontaneous Labor.—MUUS (*Centralblatt für Gynäkologie*, No. 23, 1903) has found in 1200 children born in a maternity hospital 18 cases of fracture of the clavicle, and in another series of 500, 4 cases. This gives a percentage from 1.5 to 1.3. He found no case of double fracture of the clavicle.

Among the mothers, nine were primiparæ and thirteen multiparæ. Comparison with other statistics shows that the accident is twice as frequent with multiparæ as with primiparæ.

The right clavicle was fractured in 14 cases; the left in 8. So far as the presentation of the fœtus was concerned, in 15 cases the anterior collar-bone was broken, and in 3 the posterior. The position of the fœtus was more frequently the first, the relation between the first and second being 9 to 6.

The children were usually large. Only one of them was of average weight. The accident occurs twice as frequently in male children as with female.

So far as the pelvis was concerned, it was justominor in 3 cases, and in 2 of these the child was delivered by forceps. In all there were five forceps' delivery among these cases. The percentage of frequency in cases delivered by forceps was 8.3. In 5 cases the extraction of the shoulders was difficult, and the children were of excessive size. In 4 cases the shoulders were expelled without assistance.

The fracture was always situated in the middle third of the bone. Only once was the fracture incomplete, and all cases recovered with the formation

of large callus. The injury gave so few symptoms that it was not discovered without direct examination. The children moved the arm as well as on the uninjured side. Excessive abduction only was difficult. The children were not especially disturbed by the fracture. They could be washed and dressed with no more disturbance than usual, and the fracture was never detected by a nurse. There was no deformity of the shoulder, no extravasation of blood, and very little depression at the point of fracture. The most significant symptom was crepitation, which was readily elicited. When the periosteum was not torn crepitation and abnormal movement were obtained with difficulty.

These fractures recovered in typical manner, large and firm callus forming in one or two weeks. One fracture was unhealed ten days after the injury, but healed firmly in two weeks when the arm was immobilized.

Treatment was unnecessary, but nurses were instructed to avoid excessive motion of the arm. If a firm callus did not immobilize the fracture in one week a bandage was applied.

The question naturally arises, How does fracture of the clavicle occur in vertex presentation? Usually through improper manipulation by someone who endeavors to assist the mother. The writer doubts whether the fracture always happens at the moment of birth. He believes rather that the accident occurs while the child is passing through the cavity of the pelvis.

During the operation of version and extraction fracture of the clavicle occurs in 6 per cent. of cases.

Frequency and Diagnosis of Twin Pregnancies.—SEEGERT (*Zeitschrift f. Geburtshülfe und Gynäkologie*, 1903, Band xlix., Heft 2) contributes an interesting paper upon this subject from the records of Olshausen's clinic in Berlin.

In 15,977 births twins occurred in 233, or 1 in 68.6 births. In the great majority of cases pregnancy had advanced a little beyond the eighth month.

A positive diagnosis before labor was made in 43.3 per cent. In nearly all cases the presentation of the twins was stated. Both presented by the vertex in 46 per cent. In 34 per cent. one child was in vertex and one in breech presentation. In 8 per cent. both children were in breech presentation, and in 8 per cent. one child presented by the vertex and one transversely, and in 4 per cent. one child was in breech presentation and one in transverse presentation.

In 67.3 per cent. the children were of the same sex; in 32.7 per cent., of unlike sex. In 75.4 per cent. the twins were duovular, and in 24.6 per cent. they were uniovular.

So far as obstetric operations went in these cases, they were necessary in 41.6 per cent. Of these, the forceps was used in 51 per cent., extraction alone in 35 per cent., and version and extraction in 23 per cent. Complications occurred in a considerable percentage of cases. Of these, most frequent was eclampsia, in 12.88 per cent.; next was hemorrhage, in 11.16 per cent.

In making the diagnosis more reliance was placed upon the detection of three great fœtal parts by palpation. Next in value as a diagnostic sign was the recognition of two heart sounds. Ahlfeld's sign, which consists in meas-

uring from the lowest presenting part to the fundus of the uterus, was also employed. When this distance was more than 30 cm. the probable diagnosis of twin pregnancy was made. Keilmann's sign was also present. This consists in examining to determine fluctuation in the amniotic liquid. In polyhydramnios fluctuation is distinctly felt when the finger is carried against the membranes, while in twin pregnancy this is not the case. Another interesting sign of twin pregnancy consists in prolapse of the umbilical cord without rupture of the membrane.

A New Cranial Perforator.—In the *Annali di Ostetricia e Ginecologia*, No. 4, 1903, TRIDONDANI describes a new and very simple perforator for the performance of craniotomy.

The instrument has a straight stem terminating in a trephine crown. There is no centre-pin, but a circular, hollow instrument whose edge is sharp. The sides of the crown are narrowed to join the stem, leaving an open loop beneath the crown.

This instrument has the great merit of simplicity and can be very easily sterilized.

Syncytiolysis and Hæmolysis.—In the *Zeitschrift für Geburtshülfe und Gynäkologie*, 1903, Band xlix., Heft. 2, SCHOLTEN and VEIT contribute a paper upon this subject. They find that the blood in pregnancy shows great variation. This results from fragments of chorionic villi carried into the circulation, and from the influence of erythrocytes and leucocytes and epithelia of the chorion upon each other. The result of this is the formation of syncytiolysin as a side chain of erythrocytes, and hæmolysin as a side chain of epithelia of the chorion. Hæmoglobin is thus dissolved from the erythrocytes, and protoplasm from the syncytium into the serum. The albumin from the maternal blood found in the serum is transferred to the fœtal blood. Those albuminoids which are precipitated from maternal blood through the fœtal serum do not enter the fœtal circulation, and, also, those substances which are precipitated from the fœtal serum through the mother's do not enter the maternal circulation.

The nourishment of the fœtus is secured by the albuminoids dissolved in serum, while nutritive material is given up into the maternal serum from the epithelia of the chorion through syncytiolysis. The fact that albumin derived from fœtal bodies may again enter the fœtal organism because it is dissolved in the maternal serum is accounted for by the scanty fœtal contents.

The application of the side-chain theory to the phenomenon of the transfer of chorionic villi has not only given us a better understanding of the changes occurring in pregnancy, but also a better knowledge of fœtal nutrition. The entrance of fœtal elements into the maternal circulation secures the metabolism of the fœtus.

The balance of nutrition between fœtus and mother is disturbed when too great a number of villi are absorbed; then follow excessive hæmolysis, with hæmoglobinæmia, albuminuria, hæmoglobinuria, and feeble syncytiolysis, as illustrated in eclampsia where syncytium from the villi are found unchanged in the arteries of the lungs. When the absorption of villi is diminished the changes in pregnancy are also lessened, while the nutrition of the fœtus re-

mains good. We must refer these changes to alterations in the anatomical condition of the uterus, to deficient development, or to the presence of inflammation producing diminution or increase in the absorption of chorionic villi.

Eclampsia in Early Pregnancy.—LAUBENBURG (*Monatsschrift f. Geburtshülfe und Gynäkologie*, Band xvii., 1903) reports the case of a patient, aged thirty-two years, married eight years, with two living children, and who gave birth to a dead child two years before. The last pregnancy had been normal until eight days previous. The patient then had a slight chill, and fœtal movements ceased. Labor and the puerperal period were normal. The patient had croupus pneumonia a few months before the present illness. Menstruation had been normal, but had ceased about three months before the present illness. For three weeks the patient had suffered from abdominal pain with uterine hemorrhage. For the last few days she had chills and fever, with great depression. The discharge of urine had been normal.

On examination, temperature and pulse were considerably above normal. A thin, bloody, and purulent discharge came from the vagina. The finger could be inserted through the cervix, against the lower portion of the ovum. The body of the uterus corresponded to eight weeks' pregnancy.

The diagnosis of septic abortion, probably through criminal interference, was made. As the patient shortly afterward had a severe chill, followed by high temperature and rapid pulse, she was anæsthetized and the uterus was emptied. Moderate hemorrhage accompanied this procedure.

Another severe chill occurred accompanied by eclamptic convulsions. These recurred severely every fifteen to twenty minutes, the pupils remaining unequal, and the flexor muscles of the left arm and the right leg remaining contracted. The patient became critically ill, with labored respiration, cyanosis, and venous hyperæmia. She had in all twenty convulsions. Under the free use of morphine and stimulants she slowly improved and finally recovered. She was able to leave her bed first three weeks after the abortion. She remained anæmic for some time.

The secretion of urine continued uninterruptedly, although in lessened quantity. About 200 c.cm. were secreted during the twenty-four hours when the patient was most ill. This urine was normal in composition with the exception of a faint cloudiness with albumin, which was so small that Esbbach's albuminometer could not measure it. This disappeared in twenty-four hours, and the quantity of urine increased. Bacteriological examination of the patient's blood showed cocci resembling staphylococcus pyogenes albus. The patient finally recovered.

Acute Mercurial Poisoning from Intra-uterine Injections.—YOUNG (*British Medical Journal*, June 13, 1903) reports the case of a delicate anæmic patient who had a retained placenta after delivery with forceps. The placenta was removed by hand, and an intra-uterine douche of 1 : 3000 solution of biniodide of mercury was given, followed by a douche of plain water. On the tenth day septic infection developed, and a piece of placenta was removed from the uterus. Symptoms of acute mercurial poisoning soon developed. By the nineteenth day the patient was improving, but a recurrence of the

mercurial symptoms occurred. Soreness and stiffness of the jaws, preventing mastication, severe headache, coppery taste in the mouth, severe purging and tenesmus were present. The patient ultimately recovered.

GYNECOLOGY.

UNDER THE CHARGE OF

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OF NEW YORK.

ASSISTED BY

WILLIAM E. STUDDIFORD, M.D.

The Lymph Nodes in Cancer of the Uterus.—OEHLECKER (*Zeitschrift für Geb. u. Gyn.*, Band xlviii., Heft 2) had an opportunity to study the condition of the lymphatic glands in the bodies of seven patients who succumbed to vaginal hysterectomy for cancer of the uterus. Metastases were found in two of the cases, and these were only appreciable microscopically. In no instance did a gland show such macroscopic changes as to lead to the inference that it was the seat of cancerous degeneration. In the five negative cases a few glands were enlarged, but only from inflammatory hyperplasia.

The writer admits that foci might have existed in the intermediate lymphatics which were not detected. The practical inference, according to the writer, is that mere hypertrophy of a lymph node does not warrant the inference that metastasis has occurred in it, and that consequently a radical operation is indicated.

Drainage after Laparotomy.—OLSHAUSEN (*Zeitschrift für Geb. u. Gyn.*, Band xlviii., Heft 2) reports 114 unusually complicated cases of abdominal section (out of a total of 1555) in which drainage was not employed, although most operators would have regarded it as necessary. Of these 65 were pus cases, in which purulent fluid escaped into the peritoneal cavity. Out of 56 patients with pyosalpinx and ovarian abscess, 9 died of sepsis; of 8 cases of multiple abscesses with recent peritonitis, 5 resulted fatally. In 10 cases portions of malignant growths were left in the cavity, but only one patient died of exhaustion, six weeks after operation. The writer thinks that drainage adds to the risk of sepsis. In 18 cases cyst fluids, or portions of the cyst wall, were left, but only one patient succumbed from exhaustion.

The bladder was injured three times, the intestines fifteen times, with seven deaths. Drainage was regarded as superfluous after the injuries had been repaired with double rows of sutures.

The writer concludes that drainage of the peritoneal cavity is indicated only where a pus focus remains, as in appendical abscesses. The peritoneum should be carefully protected with gauze-pads before attempting the removal of a probable pus sac, and adhesions must be separated with great care. Careful dry sponging is necessary before closing the cavity.

Cancerous Inoculation of the Abdominal Wound.—Olshausen (*Zentralblatt für Gynäkologie*, 1903, No. 11) reports six cases in which cancer developed in the abdominal cicatrix after a previous ovariotomy, in one instance twenty-one years after operation. The writer has no doubt that these were cases of inoculation, as the disease appeared on the side of the scar corresponding to the site of the tumor.

The time at which the disease appeared in the abdominal wall varied from two to nineteen years; in the case of a benign glandular cystoma a similar growth developed in the cicatrix seventeen years after operation.

Hemorrhage from a Graafian Follicle.—Schauta (*Zentralblatt für Gynäkologie*, 1903, No. 12) reports the case of a woman, aged forty-three years, whose adnexæ were left after vaginal extirpation of a fibroid uterus. Oozing was noted a few hours after the operation, which continued until the pulse became so weak that the gauze tampon was removed, and an unsuccessful attempt was made to discover the source of the hemorrhage.

On opening the abdomen and removing the clots which filled the pelvis the stumps were found to be perfectly dry, while blood was escaping from a ruptured follicle in the left ovary. The ovary was removed and the patient rapidly recovered from the effects of the hemorrhage, which must soon have proved fatal.

Schauta reports a similar case in which bleeding from a ruptured follicle was checked by ligating the ovarian vessels, the laparotomy terminating fatally from septic peritonitis.

The writer adds that while it is well known that profuse bleeding and resulting hæmatocele may follow rupture of a Graafian follicle, attention has not previously been called to the fact that this may occur in an ovary that has been left after hysterectomy. He infers that if ovaries are preserved, careful attention should be given to ripe or recently ruptured Graafian follicles, since after ligature of the large arteries the increased blood pressure in the follicles may result in hemorrhage such as that described.

Tubo-ovarian Cysts.—Preiser (Inaugural Dissertation; abstract in *Zentralblatt für Gynäkologie*, 1903, No. 11) recognizes two modes of development, viz: 1. The coalescence of a hydrosalpinx or pyosalpinx and an ovarian cyst, in which the fimbriæ entirely disappear. 2 The fimbriæ either float freely within the ovarian cyst, or are spread out on its inner wall. Here the ovary seems to have little, if anything, to do with the formation of the cyst wall.

Pfannenstiel believes that in the second variety the cyst is originally an abscess around the distal end of the tube, which becomes encysted, as shown by the fact that its wall consists of lamellated connective tissue with round-cell infiltration and granulation tissue. The writer does not believe with Waldstein that they are derived from hæmatoceles.

The results of the development of tubo-ovarian cysts are *hydrops ovarii profluens* and intermittent hydrorrhœa, and ectopic gestation.

Tubal Menstruation.—Moltzer (Inaugural Dissertation; abstract in *Zentralblatt für Gynäkologie*, 1903, No. 13) describes the anatomical appearance of Fallopian tubes removed from a young girl on the second day of

normal menstruation. Fresh blood was observed at the fimbriated ends. In serial sections œdema, hyperæmia and hemorrhagic infiltration were noted. Leucocytes were present in the subepithelial tissue and between the epithelial cells, some of which were exfoliated. Fresh blood within the tubes and at the abdominal ostia had evidently come from the superficial capillaries The changes were most marked at the uterine end.

Influence of Diabetes on the Female Genitals.—CALLIAN (*Zentralblatt für Gynäkologie*, 1903, No. 16) presents the results of his observations in 58 cases of diabetes. Pruritus vulvæ was the most common condition.

The writer emphasizes the importance of careful examination of the urine in all women with pelvic troubles, since glycosuria may be present without polyuria. The gravity of the prognosis is directly proportional to the sexual activity of the patient.

Atrophy of the uterus and ovaries due to arterial sclerosis is common, and above all menstrual disturbances. The writer has observed marked relief of the diabetes after the removal of fibroids, but he advises operation only if life is threatened by hemorrhages, otherwise the treatment should be confined to a strict antidiabetic diet.

Uterine Hemorrhages in Typhoid Fever.—SOUKOSTAVSKA (*Zentralblatt für Gynäkologie*, 1903, No. 16) states that metrorrhagia frequently appears during the course of typhoid, especially in women who are anæmic or menstruate irregularly. This phenomenon is usually noted at the height of the disease, rarely at the beginning. The hemorrhage lasts from four to five days, and may recur frequently, but rarely affects the patient's general condition. Menstruation may appear prematurely in young girls, or may return in women who have recently passed the climacteric.

The writer explains the hemorrhage as due to increased blood pressure within the abdomen. No special treatment is necessary, calcium chloride being preferable to ergotin. It is not necessary to suspend bathing during the flow.

Tumors of the Round Ligament.—EMANUEL (*Zentralblatt für Gynäkologie*, 1903, No. 17) has collected 76 cases from the literature, to which he adds four others from his own practice. The tumors in his cases were about the size of a pigeon's egg, and were situated in front of the external ring. Two were lymphangiectatic fibromyomata and two pure fibromata. Of the collected cases, 58 were extraperitoneal, being outside of the canal, and only 18 were situated within the pelvis. In no instance has a tumor been found within the canal. Fibromata and fibromyomata are most common.

Laparotomy in Tuberculous Peritonitis.—THOENES (*Zentralblatt für Gynäkologie*, 1903, No. 17) reports 33 cases, from which he draws the following conclusions: 1. In the serous form the prognosis is good, provided that there are no marked visceral complications. 2. The absence of fever and weak heart action usually indicates that such complications are not present. 3. In most cases in which there is no effusion abdominal section is dangerous, or is rarely followed by good results, excluding primary tuberculosis of the tubes.

Retro-uterine Hæmatocele.—LEWINSOHN (Inaugural Dissertation; Abstract in *Zentralblatt für Gynäkologie*, 1903, No. 8) combats the prevailing view that hæmatocele is always due to ectopic gestation. The hemorrhagic peritonitis of Virchow is a well-known cause. Of eleven cases in Winckel's clinic, only four were due to ectopic. Winckel holds that hæmatocele is found in 0.5 per cent. of all gynecological cases, Olshausen in 4 per cent. The former strongly opposes surgical intervention, and has never lost a case in which expectant treatment was followed.

Menstrual Psychoses.—KRAFFT-EBING (Abstract of Monograph in *Zentralblatt für Gynäkologie*, 1903, No. 8) distinguishes several varieties of psychical disturbances attending menstruation, viz.:

1. Psychical manifestations accompanying the first appearance of menstruation. There may be from two to ten or twelve attacks of the melancholic or maniacal type, and the prognosis is generally good as soon as the menses become regularly established.

2. Psychoses attending ovulation. These are noted in neurotic individuals, usually as the result of a nervous shock, and appear as a severe but transient mental confusion, which is apt to recur each month, even in cases of amenorrhœa. These disturbances cease during pregnancy and after the menopause. An hereditary tendency is noted in most cases, and the attack may simulate violent mania or melancholia. They last from five to fourteen days or more. Suicidal impulses are sometimes present. The writer recommends sedatives, hypnotics, baths, and ice-packs, while in the intervals the mental and physical habits are regulated. The prognosis is good, except in cases in which mental degeneration is present. Castration may be considered as a last resort.

3. Cyclic menstrual psychoses are coincident with the menstrual wave, and appear in the form of premenstrual attacks of maniacal excitement or actual insanity, which increase in severity until the height of the wave, changing to depression and melancholia with its subsidence. This type is of considerable medico-legal importance, since the subject may entertain violent feelings against society, leading to criminal acts, such as theft, arson, or even murder. Hence, the writer advises that in the case of female criminals careful attention should be directed to the fact if the crime was committed at the time of menstruation, and if she had been habitually subject to mental disturbances at this period.

Calcification of the Ovary.—MILANDER (*Zentralblatt für Gynäkologie*, 1903, No. 8) reviews the literature of the subject, and adds a case to the fifteen already reported. His specimen contained several calcified corpora lutea. The ovary had become entirely separated from its attachment to the uterus (migrant), and was found free in Douglas' pouch without any adhesions.

The writer infers that the deposit of lime-salts was due to disturbance of nutrition of the ovary, referable to pressure of a tumor on the opposite side, its migration being secondary.

[The writer can add a second case of calcification of the ovary to the one previously described by Williams.—H. C. C.]

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF

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Adrenalin in Epithelioma.—M. MAHU presented to the Laryngological Otological, and Rhinological Society of Paris, February 20, 1903 (*Annales des Maladies de l'Oreille, du Larynx*, etc., May, 1903), a man, sixty-four years of age, who had had for some time an ulcerating and hemorrhagic epithelioma on the left side of the tongue, which was so much improved and benefited by applications of adrenalin solution (1 : 1000) as to promise continuous comfort the remainder of his life.

In the discussion Lermoyez reported a similar success after tracheotomization in a man, thirty-three years of age, with a voluminous epithelioma of the larynx. The patient, who seemed on the verge of succumbing, improved rapidly within a week, and at the time of the report was still occupying his bed in a hospital.

Surgical Relief of Adhesion between Soft Palate and Pharyngeal Wall.—At the meeting of the Laryngological Society of London, March 6, 1903, HERBERT TILLEY (*Journal of Laryngology, Rhinology, and Otology*, May, 1903) showed a case illustrating an operative procedure which he had practised in a female, twenty-three years of age, for relief of almost complete adhesion of the soft palate to the posterior wall of the larynx, the result of tertiary syphilis.

Six weeks previously the operation had been performed under preliminary laryngotomy, by free division of the soft palate from the pharyngeal wall and the introduction of silver wires through the soft palate on either side so as to form loops presenting posteriorly, the free ends of the wire being brought forward under firm traction upon each side of an incisor tooth, where they were twisted upon each other and cut off short in front of the tooth. One wire cut out in about ten days and the second in a fortnight; but by this time considerable healing had taken place over the raw surfaces from which the adhesion had been separated.

Every day for three weeks the house surgeon had passed his finger into the rhinopharynx and had exercised firm traction forward upon the soft palatal structures. The result appeared to be most excellent.

Ulcero-membranous Amygdalitis.—At a recent meeting of the Section on Pediatrics of the New York Academy of Medicine, DR. W. N. BERKELEY exhibited (*Journal of American Medical Association*, March 14, 1903) a boy, six years of age, whose tonsil presented on its upper margin a deeply-excavated ulcer, smears from which revealed the spirillæ and elongated bacilli described by Vincent as characteristic of a special form of ulcero-membran-

ous stomatitis. Dr. Charles Herrman predicted that future bacteriological study would show that this same ulcerative process occurred in other parts of the body as well as in the throat.

Phlegmonous Lingual Periamygdalitis.—L. DEPOUTRE, of Cambrai, reports (*Annales des Maladies de l'Oreille, du Larynx*, etc., May, 1903) a case in a man, thirty-five years of age, which was relieved by incisions. A few other reported cases are referred to in the accompanying remarks.

Amygdalitis Localized in a Supernumerary Tonsil.—DR. FAYETTE C. EWING, of St. Louis, Mo., reports (*Laryngoscope*, January, 1903) a case of well-developed supernumerary tonsil between the posterior pillar of the soft palate and the pharyngeal wall affected with a typical amygdalitis without any associate involvement in the adjacent normal tonsil.

Amygdalotomy.—For the purpose of cutting away large tonsils, DR. ARTHUR BAILIE FRANCIS, of Carrickfergus (*Medical Press*, April 15, 1903), has devised a tonsil sector in which a pair of semicircular scissors-blades move inside a circular guarding ring, through which the tonsil is pulled forward with a small vulsellum to the point at which the section is desired.

Lymphoid Growths at the Vault of the Pharynx.—EUGENE LABARRE, of Brussels, extols (*Annales des Maladies de l'Oreille, du Larynx*, etc., May, 1903) the ablation of adenoid vegetations with the electrothermocaustic curette of Rousseaux, in the handle of which he has made some illustrated improvements which facilitate its use.

At a meeting of the Laryngological, Otological, and Rhinological Society of Paris, January 9, 1903 (*Ibid.*), GALAND reported a case of an adenoid infant in whom digestive troubles were produced by pus which ran from the rhinopharynx into the stomach. On currettage a flow of pus accompanied the pharyngeal mass, in which a calculus was found in addition. From this moment the digestive symptoms—both gastric and intestinal—disappeared completely.

In the discussion following a number of cases were reported in which nursing children had been relieved of digestive troubles by removal of lymphoid vegetations at the vault of the pharynx.

Recurring Multiple Angiomata of the Septum.—This case was reported by DR. JOHN O. MCREYNOLDS, of Dallas, Texas, at the last meeting of the American Medical Association (*Journal of American Medical Association*, March 7, 1903). A man, thirty-two years of age, had on each side of his cartilaginous septum a few dark blue elevations, each about the size of a pea; discrete, rounded in shape, and most enormous in the anterior superior portion of the septum. Electric cauterization destroys the growths temporarily, but in a few weeks others have become reproduced.

Postnasal Polyp Adherent to the Septum of the Nose and the Soft Palate.—CHAVASSE records (*Archives Internationales de Laryngologie, d'Otologie et de Rhinologie*, January and February, 1903) in an article on rhino-

pharyngeal polypus extracted by way of the mouth, a case of supposed rhinopharyngeal polyp in a male cook, twenty years of age, from whom a number of small nasal polypi had been removed. Posterior rhinoscopy revealed the existence of a large rosy-gray polyp, situated transversely upon the soft palate and occluding the septum and the posterior nasal outlets against which it was applied. Several attempts to remove it with the cold snare and the pharyngeal forceps failed. It was eventually extracted by means of Doyen's gouge, with which the adhesions of the septum and of the soft palate were separated, so that the tumor hung into the pharynx, attached by a fine pedicle upon the posterior extremity of the right turbinate body, whence it was readily removed by simple traction with the adenoid forceps. Histologically the growth was a fibrous polyp with a few myxomatous points.

Foreign Body Removed from the Left Primary Bronchus with the Aid of Direct Bronchoscopy.—GUSTAV SPIESS (*Deutschen med. Wochenschrift*, 1903, No. 8) reports this interesting case: A woman, forty-three years of age, inhaled a soup-bone, which became impacted in the left bronchus and produced bronchitis with abscess. Eighteen months after the accident it was found impossible to expose the deep portions of the trachea either by laryngoscopic or bronchoscopic inspection, and the Röntgen rays failed to reveal any evidence of the foreign body. Four months later, the patient having been getting worse and worse, a tracheotomy was performed, and a bronchoscopic inspection made through the orifice, under cocainization, in the sitting position. The bone was recognized in the left bronchus directly beneath the bifurcation, and, after several sittings, was finally removed with forceps. The patient made a good recovery.

Pemphigus of the Larynx.—DR. LEWIS A. COFFIN presented to the New York Academy of Medicine (*Laryngoscope*, February, 1903) a trained nurse, who had been under Dr. O. B. Douglass' care, with an ulceration of the epiglottis and recurrent pseudomembranous patches, the coverings of broken-down blebs in portions of the pharynx, and especially upon the soft palate. The patient also had a pemphigoid eruption about the umbilicus, which led to the establishment of the diagnosis.

Influence of Thyrotomy on the Singing Voice.—At a meeting of the Laryngological, Otological, and Rhinological Society of Paris, February 20, 1903, SUAREZ DE MENDOZA presented (*Annales des Maladies, de l'Oreille, du Larynx*, etc , May, 1903) a woman, thirty years of age, who some few months before had been subjected to median thyrotomy in a hospital in search of a pin believed to have been inhaled into the larynx, although no signs of it were detected by radiography. There was no pin except in the imagination of the patient. The patient left the hospital seventeen days later with the wound healed, but aphonic.

Some two months later, while still aphonic, Dr. Mendoza discovered a polypoid growth the size of a pea—probably proud flesh—located beneath the anterior commissure of the vocal bands; he removed this with forceps, and the voice soon became sufficiently clear for conversation, but not for

singing. A more attentive examination of the larynx showed that the vocal bands were not at the same level. Dr. Mendoza proposed the question whether in case a similar condition should occur in a professional singer the indication would be to operate a second time in order to attempt to place the divided parts in exact juxtaposition, and thus restore the normal plane of the deviated vocal band. No comments upon this question accompany the report.

Laryngectomy for Carcinoma.—Prof. E. Fletcher Ingals, of Chicago, read an article on laryngectomy for carcinoma at a recent meeting of the American Medical Association (*Journal of American Medical Association*, March 7, 1903), in which he reproduced the clinical remarks made by the late Prof. Fenger, who performed the laryngectomy, the last operation of his life's work. This lecture presents an excellent concise summary on the subject of laryngectomy. As far as regards the case operated upon, recovery was uneventful.

Sarcoma of the Pharynx.—An additional case of failure of the Röntgen rays in a case of sarcoma of the pharynx has been reported by Dr. Henry Perkins Moseley (*American Medicine*, January 31, 1903) among a series of twelve cases of malignant disease thus treated.

Foreign Bodies in the Œsophagus.—Dr. R. J. Ward, of East Barrington, N. H., reports (*American Medicine*, February 7, 1903) a case in which he removed a fish-bone, one inch in length, from the œsophagus by making the patient swallow a snarl of ordinary grocer's twine, which was then withdrawn, entangling the foreign body.

OTOLOGY.

UNDER THE CHARGE OF

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Diseases of the Ear and Life Insurance.—Burger (*Klinische Vorträge aus dem Gebiete der Otologie*, etc., Band v., Heft 4) believes that the condition of the ears is not given sufficient attention by the insurance companies in accepting applications for life insurance. The ordinary examiner is unable to determine properly the risk on an applicant with an ear affection.

An applicant with acute inflammation of the outer or middle ear should not be accepted until after the complete cessation of the affection. The

severer cases of chronic external otitis—*e. g.*, those where the seat of the trouble is in the depths of the canal or affecting the membrana tympani, should be under observation for a time before being accepted. The different forms of chronic catarrhal affections of the middle ear are to be regarded as harmless from the standpoint of life insurance.

The greatest interest attaches to the cases of chronic suppurative disease of the middle ear. Statistics in regard to the relative frequency of a lethal outcome in such cases are, up to the present time, of little value on account of their incompleteness. But Burger concludes that an applicant for life insurance should unquestionably be refused insurance when it has been determined that he has chronic suppurative otitis media with any of the following conditions present:

(*a*) An inflammation in the attic or mastoid;

(*b*) Tuberculosis or cholesteatoma formation;

(*c*) Encroachment of the process on the bone;

(*d*) Facial paralysis, or when

(*e*) The otitis is accompanied by vertigo, or lateral headache, or when to the otitis is added the complication of a considerable narrowing of the external canal, which interferes with the free discharge from the ear. Other cases of chronic suppurative disease of the middle ear should not always be refused insurance, but, under the control of an examination by an ear specialist, be accepted with some increase in the premium.

Cases of healed suppurative disease should be accepted; only those with persistent perforation of the membrane should require a slight increase in the premium. Cases cured by "radical operation" should be taken, with the exception of those with large retro-auricular openings, at an increased premium. Binaural deafness of a high grade and cases of ear diseases of any kind, with vertigo, should be accepted with increased premium because of danger from accident on the streets, etc.—W. A. L.

Pathological Histology of the Labyrinth.—ALEXANDER (*Archiv f. Ohrenheilkunde*, Band lvi., Heft 1 und 2). This latest contribution of Alexander to the pathological histology of the internal ear rests upon the examination of the material obtained from a man aged sixty-six years, who died from the immediate effects of operation for carcinoma of the tongue. No exact test of the man's hearing was obtained, but it was determined that he had double-sided deafness, hearing a whisper 5 m. and a conversational tone 3 m. Post-mortem examination showed chronic arterio-sclerosis. Alexander obtained both organs of hearing and medulla oblongata eight hours post-mortem. Macroscopic examination showed nothing abnormal in the appearance of the middle or outer ear or the medulla.

Microscopic examination of the prepared temporal bone showed nothing abnormal in the region of the oval or round window. Nothing abnormal was found in the perilymphatic space. In the membranous labyrinth the pars superior was normal, as also the macula sacculi, the ductus reuniens, and the blind ending of the cochlear canal of the pars inferior.

Important pathological changes, however, were met with in the epithelium of the ductus cochlearis, and these were evident in various situations. The neuro-epithelium of the papilla basilaris was, in places, entirely replaced by

irregular polyhedral or cubical epithelial cells, and the epithelium of the sulcus externus and the sulcus internus, varying in form from pavement to cubical epithelium, merged into the reticular membrane from either side. In places remnants of hair-cells and rods, the latter thin and atrophic, were seen. The tunnel-space was obliterated. In one place, the zone made up by the second and third fourths of the basal turn of the cochlea, the papilla basilaris was replaced entirely by a simple layer of pavement epithelium. The tissue between the lamellæ of the lamina spiralis was remarkably deficient in nuclei and fibres. Here, also, the nerve fibres were few in number, this deficiency being especially marked in the region where there was the greatest atrophy of the papilla basilaris. The spiral ganglion was also atrophied in regions corresponding to the papilla atrophy, the nerve cells of the ganglion, entirely normal in appearance, being much diminished in number. The cochlear branch of the acusticus was atrophied, being about two-thirds of its normal diameter, and some of its fibres showed degeneration of the medullary sheaths and axis cylinders, whereas the vestibular branch was normal. The case then presents a disease process in the cochlea and the cochlear nerve without any involvement of the rest of the membranous labyrinth, the middle and outer ear being normal. Alexander distinguishes three grades of atrophy which were found in different regions in this case:

1. The papilla basilaris shows only slight histological changes. In the midst of nearly normal surroundings there is a limited disappearance of the sense cells (either of the hair-cells alone or hair and rod-cells).

2. The papilla is entirely atrophied, the sense cells and also the supporting cells having disappeared. (In the latter are included the cells of the spiral sulci and the cells of Hensen, Boettcher, and Claudius.) The papilla is replaced by a pavement epithelium which covers the endolymphatic surface of the basilar membrane. As etiological factors in producing this condition of the labyrinth, Alexander points out the arterio-sclerosis of the individual and the complicating cachexia of his tongue-carcinoma. The article is illustrated with plates containing twenty-nine figures which show excellently the various degrees of pathological change above described, but it is to be regretted that there are not more of the more normal parts of the cochlear organ figured for comparison.—W. A. L.

The Closure of Retro-auricular Openings by Means of Subcutaneous Injections of Paraffin.—Hugo Frey (*Archiv für Ohrenheilkunde*, Band lvi. Heft 3 und 4). The persistence of a retro-auricular opening following the radical operation is, according to Frey, to be avoided in the majority of cases, although he believes, following the teaching of Politzer, that in those cases with tendency to cholesteatoma formation, where a recurrence of the process is to be expected, a permanent opening is desirable. With the exception of this class of cases a closure of the retro-auricular opening should be attempted either at the time of the operation or at some later period by a suitable plastic. If, however, the opening persists, a convenient method of closing it is by means of subcutaneous injections of paraffin around the borders of the opening. The method of injecting the paraffin is that first suggested by Gersuny. The paraffin is injected into the subcutaneous tissues around the opening by means of an ordinary subcutaneous syringe. (Frey

uses the solid glass syringe of Luer.) The paraffin used (unguentum paraffini) must be of a salve-like consistency and have a melting point of 40° C. As a practical method Frey finds that to take about equal quantities of hard paraffin and liquid vaseline and mix them over a hot-water bath, and then vary the amount of the two constituents until a drop allowed to fall on the hand becomes immediately of a salve-like constituency, is perfectly satisfactory. The paraffin thus prepared is injected by inserting the needle of the subcutaneous syringe about 5 cm. outside of the border of the exenterated cavity in two or three places around the circumference. To keep the paraffin from filling the whole posterior opening of the cavity, this is plugged with gauze from the bottom up to within a distance of 5 cm. from the mouth of the cavity. After the borders of the opening have been brought together by means of the paraffin injections a real closure may be effected by refreshing the edges of the approximated borders, which then unite together. The process of injecting is somewhat painful to the patient, and therefore, in some cases, it is advisable to inject Schleich's mixture first.

Cases where there is only a thin layer of cicatricial tissue closely adherent to the underlying bone around the opening are not adapted to this method, and, unless there is a certain amount of movable skin with its subcutaneous tissue in this situation, this method cannot be used safely for fear of pressure necrosis. Openings larger than 1.5 cm. in diameter are also not adapted for this method.

Frey reports, briefly, seven cases of persistent retro-auricular openings closed by paraffin injections, and gives photographs of the condition before and after treatment.—W. A. L.

The Voice as a Means of Testing Hearing.—(*Klinische Vorträge aus dem Gebiete der Otologie*, etc., Band v., Heft 7.) The first part of Treitel's monograph is a criticism of the work of Oscar Wolf, which he believes to be inaccurate in some points. The assertion of Wolf, that the non-perception of various test words is directly proportionate to the size of the perforation in the membrana, can no longer be considered to hold good, the degree of non-perception being dependent rather upon the amount and kind of the fixation of the ossicular chain.

That the higher in the scale the fundamental tone of a consonant is the more easily it will be perceived, that those consonants which come nearest in their clang-color to the so-called simple tones are most difficult to comprehend, and that those the clang-color of which is composite of a number of harmonic tones are more easily perceived, are facts resting upon data, according to Treitel, to be explained largely by the disposition of the individual, his ability to concentrate his attention, his imagination, etc. The question is a psychical as well as a physical one.

For the exact differentiation of affections of the middle ear from those of the inner ear Treitel insists that the use of tuning-forks is essential, but that some probability of the former is shown by the more or less complete inability of a patient to hear such words of low pitch as "mutter," "uhr," "zucker," etc., and that the more or less complete inability of the patient to hear such words as "messer," "teller," "Friedrich," etc., words of high pitch, speaks for the latter.—W. A. L.

OPHTHALMOLOGY.

UNDER THE CHARGE OF

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A Case of Retinitis Pigmentosa, with Pathological Report.—W. T. LISTER (*R. L. O. H. Reports*, January, 1903) reports the case of a man, aged sixty years, who had suffered from retinitis pigmentosa for many years in both eyes; he had been totally blind for some years before his death. There was a strong history of insanity in the family, and the man himself died in an insane asylum.

Pathological Examination. Lens opaque throughout, vitreous fluid, retina and choroid so intimately united that separation of the two was impossible. The retina in its posterior two-thirds was deeply pigmented, the anterior third, a zone about 7 mm. in width, was pale and unpigmented, contrasting strikingly with the posterior pigmented portion. The macular region was pale gray and much less pigmented; retinal vessels extremely minute.

Microscopic Examination. Nerve more fibrous than usual, septa thicker; retina completely atrophied in the darkly pigmented area, trace of the normal retinal layers only in the parts close to the disk and macula; choroid is atrophied and the chorio-capillaris layer has disappeared. Taken as a whole, the changes are: concentric atrophy of the retina, with pigmentation and degeneration of the retinal vessels, associated with a variable amount of chronic inflammatory change.

"Some hold that these changes are brought about by primary vascular disease, either of the retina or choroid. But the concentric defect corresponds with *nerve distribution* rather than a *vascular* distribution, and therefore I think we must look for a degeneration commencing primarily in the nervous tissues rather than in either vascular system."

Is Syphilis, or a Lowered State of Vitality, "a Distrophic Influence" Transmissible to the Third Generation?—COLLINS, London (*R. L. O. H. Reports*, January, 1903) has examined the children of twelve mothers who had suffered from interstitial keratitis with other signs of inherited syphilis. The twelve women had had sixty children and five miscarriages between them; thirty-four of the children are living and twenty-six have died. Of the thirty-four living children, twenty-five, varying from nineteen years to four months, are stated to be healthy. Fourteen of these have been examined by the writer and appeared healthy in every respect. Nine are unhealthy. One of these seems to have presented definite syphilitic symptoms, and three of the others symptoms which may have been syphilitic. Without any history

of the presence or absence of primary syphilis in the father, this cannot be taken as proof of the transmission of syphilis to the third generation. On the other hand, the small proportion of the living children who have had symptoms of a syphilitic character is presumptive evidence against transmission to the third generation. From a further study of the mortality among the children of the two generations, the writer concludes that the mortality among the children of parents who have had primary syphilis is somewhat greater than among the grandchildren; the mortality of the latter was found in this series to be twice the average infant mortality in London, so as to make it impossible to avoid the inference of the presence of some distrophic influence.

The smallness of the number of miscarriages in the twelve women, the subjects of inherited syphilis, would seem to show that the distrophic influence does not make itself felt upon the fetus in utero.

Two Hundred and Fifty Operations for Primary Cataract.—ELLIOTT, Indian Medical Service (*Lancet*, May 2, 1903) reports a second series of cataracts operated in the Government Ophthalmic Hospital, Madras.

Iridectomy and irrigation of the anterior chamber were employed in every case but one. Ninety-six per cent. recovered with useful vision, 2 per cent. counted fingers from a half metre to one metre, and 2 per cent. were failures.

By "useful vision" the operator means vision from 0.6 (6.8 per cent.) to 0.2—0.1 (48.2 per cent.). "In testing the vision on discharge only spheres were used," and these but imperfectly. Secondary operation was required in 6.8 per cent. The complications before, during, and after operation were mostly insignificant.

Retinal Hemorrhages as a Diagnostic Feature in Fracture of the Base of the Skull and in Subarachnoid Hemorrhages.—FLEMING (*Edinburgh Medical Journal*, April, 1903) reports a series of cases of fracture of the skull which he divides into three groups. In Group I. the subarachnoid hemorrhage was mostly unilateral, and retinal hemorrhages were present, but confined to the eye on the same side. All of these cases in this group were fractures of the base excepting one, which was a fracture of the squamous portion of the temporal bone. In that particular case the fracture was on the left side, and the subarachnoid effusion on the right.

Group II. were cases of fracture of the base in which there was bilateral subarachnoid hemorrhage with retinal hemorrhages in both eyes.

Group III. contains those cases in which there was a fracture of the base, without any retinal hemorrhages being present.

Group IV. contains cases of subarachnoid hemorrhage which were not secondary to fracture of the base, but to intracerebral hemorrhage.

The conclusions reached from these cases are that a subarachnoid hemorrhage, if sufficiently rapid in its development, will cause retinal hemorrhage, and that if the effusion is unilateral the hemorrhage will be confined mostly to the affected side. The exceptional cases in these series the author explains by an extraordinary amount of bruising in the region of the chiasma, which prevented the effused blood from entering the intersheath space, and by the

slow rate of bleeding into the subarachnoid space. It is not very easy to explain why the sinus basalis should not distribute the blood which passes into it equally into the sheaths of the two optic nerves, because there is no median raphé, and the sheath of the pituitary is the only structure which divides the space in any sort of way. The only reasonable explanation seems to be one based on hydrostatic principles. There is no question that the blood enters the intersheath space from the sinus basalis, and that it is not effused from the vessels of the pial sheath. Presumably the sudden distention of the intersheath space, just behind the eyeball, causes great increase of pressure in the retinal vessels, and rupture. Unilateral retinal hemorrhages are the rule in cases of a unilateral subarachnoid hemorrhage. The author believes that the recognition of retinal hemorrhages "will be helpful in the diagnosis of cases of fracture of the skull and in those instances of intracerebral hemorrhages where rupture occurs and the blood reaches the subarachnoid space, causing sufficient and sudden increase of pressure to produce retinal hemorrhages." Unilateral retinal hemorrhages determine, however, the site of the subarachnoid effusion, and may be helpful in choosing the best site for trephining.

Theory of Glaucoma; So-called Inflammatory Glaucoma; a Neurosis.—LAQUEUR (*Arch. f. klin. Med.*, vol. lxxiii.) calls attention to the influence of the nervous system upon secretion. Irritation of the facial at the base of the brain causes a profuse flow of tears in the rabbit, while after division of this nerve the gland cannot be made to function. The nerves governing the secretory activity of skin are also known, likewise those affecting the secretion of the mammary gland and the kidney. Although in all of these instances the blood furnishes the material for the secretion, increased secretion may take place without hyperæmia. Analogously Laqueur assumes that the secretion of the intraocular fluids takes place under the influence of special nerve-supply different from the vasomotor. For the occurrence of an attack of glaucoma through hypersecretion an additional factor is necessary, a disturbance of the mechanism regulating the intraocular tension, most frequently a narrowing of the excretory canals—*e. g.*, Knies' anterior peripheral synechiæ. This anatomical change, however, is only to be regarded as a predisposing element in so-called inflammatory glaucoma.

The X-ray Treatment of Trachoma.—WALSH, London (*Medical Press and Circular*, 1903, No. 7), reports four cases of typical and severe trachoma, the cornea being involved in three, treated by the X-rays. Marked improvement occurred from the first application in all. Two cases seemed to be cured after sixteen and seventeen exposures, respectively. The others promised equally favorable results with continued treatment.

The average exposure was from ten to fifteen minutes. It is not necessary to keep the lid everted. On several occasions slight superficial dermatitis of the lid was noted. A mask of lead prevented further mischief. The clearing up of the corneal opacities and the partial disappearance of the pannus suggest an extended and important application of the Röntgen methods in ophthalmic work. This treatment, moreover, has the great merit of painlessness.

HYGIENE AND PUBLIC HEALTH.

UNDER THE CHARGE OF

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Yellow Fever and the Panama Canal.—Scarcely had the discovery of the dependence of malarial fever on the part played by mosquitoes of the genus Anopheles as intermediary hosts for the hæmatozoa, first observed by Laveran, been proved by observers in every part of the world, than a small band of American physicians demonstrated the like alternation of generations, as it used to be called, in the case of the parasite of yellow fever, which is also a microzoon, not a microphyte, the host being in most instances the Stegomyia fasciata, though other species prevalent in other regions are equally adapted for the purpose. And this discovery has removed the obscurity that formerly surrounded its etiology, presenting a full and satisfactory explanation of the previously insoluble problems of its geographical distribution, the evident non-communicability of the disease when it appeared outside of its natural areas, although these areas were gradually widening; its attachment to the cargo rather than to the persons of the crew, who might escape, while the laborers engaged in unlading were attacked; the ease with which a ship is disinfected by so feeble a germicide (though active insecticide) as sulphur fumigation, and the cargo by mere breaking up and exposure to the air and light—these and other apparent anomalies have now received a full explanation.

The demonstration of the disease as one which cannot, like smallpox or other fevers, be communicated directly from one patient to another, or the virus of which cannot be conveyed by fomites, renders all notion of quarantine unreasonable, and the recognition of its nature as the destructive action on the red blood cells exerted by a hæmatozoon which, introduced by the bite of an infected Stegomyia, runs through this stage of its life history within a few days of incubation and fever, after which it disappears unless taken up by a Stegomyia, in whose body it undergoes a transformation, extending over twelve to fourteen days, and retains its vitality and virulence for at least two months, being capable at any stage of this period of inducing the disease in a person in whom the Stegomyia may implant it in the act of biting. Save as regards its tolerance of low temperatures, the Stegomyiæ are among the hardiest of the gnats, but as the recognition of the connection of malarial fevers with the Anopheles enabled the Italian Government to banish the disease from the convict settlement and island of Asinari by exterminating the insects and their larvæ, so by similar measures undertaken by General Wood, and carried out by his energetic sanitary officer, Major Gorgas, yellow fever has been stamped out in Havana, where, up to the year 1900, the deaths had, for 150 years, amounted to hundreds, or even thousands, an-

nually. Were it not for the *vis inertiæ* of official apathy one would think that the knowledge thus gained would be applied in all the great centres of population and commerce, but there seems at present little prospect of such activity, though in the Southern States, where the winter temperature is mostly too low to permit of the disease persisting; that is, of the Stegomyia surviving until the following summer, in the smaller islands of the West Indies, and in the great cities of the South American Republics, especially of Brazil, where they are to a great extent isolated by the thinly peopled intervening country, the task of exterminating these insects should be much easier than it was at Havana, and would be in Cuba, Jamaica, etc. But Dr. Manson, who, by his discovery of the origin and mode of transmission of the parasitic nematoids in filariasis, twenty years ago, was the first to call attention to the function of mosquitoes of acting as intermediary hosts for the blood parasites of man, has pointed out the possibility, indeed, unless the most strenuous preventive measures are adopted, the certainty of yellow fever being introduced into Asia when direct commercial intercourse shall have been established through the opening of the Panama Canal. The social, economic, and sanitary conditions of the great seaports of China, India, and East Africa are even more favorable to its naturalization than those of its homes in Central and Southern America, and those of Australia, especially of Queensland, not less so, Stegomyia of one or other species abounding throughout the tropical zone. That yellow fever has hitherto been unknown in Asia is simply due to the fact that all trade between America on the one hand, and Japan, China, Manila, Batavia, Singapore, and Australia on the other, has been via the ports of British Columbia, California, and Chili, all of which lie well without the fever zone, and any ocean tramp sailing direct from, say, Rio to Hong Kong, would be too long on the passage for Stegomyiæ concealed in its hold to retain their infectivity even should they survive the voyage around the Horn. But with the opening of the Isthmian canal, totally new conditions will be established. A steamer from a port in Cuba, Venezuela, or Guatemala might take on board some Stegomyiæ that had recently bitten a fever patient, and a fortnight later, when the hæmatozoa had completed their metamorphosis, they might in their turn bite some of the crew, who would in three days sicken with the fever. They would probably be landed at the first port of call, and the local Stegomyiæ biting them would in due time communicate the disease in like manner to the native population, setting up an epidemic which, in the crowded native quarter of a Chinese city, would soon pass beyond control. Nor would it be necessary that cases of fever should occur on the voyage; Stegomyiæ taken on board would, after the vessel had left the port, seek the shelter of the hold, subsisting on any loose sugar, fruit, the blood of rats, etc., and perhaps breeding in the bilge or water tanks. Not until the cargo was discharged need they leave their hiding places, when they would attack the stevedores and native coolies engaged in unlading, who would sicken in their homes. This, indeed, occurred at St. Nazaire, at Cardiff, at Naples, and at Oporto, but in these places the disease did not spread further, there being no Stegomyiæ so far north of the equator, at any rate as France and England, for they are found in some parts of Italy and Spain. In framing measures for guarding against the introduction of yellow fever it must be borne in mind

that the disease is not carried by fomites, and that the patient is not a danger to his fellow-men any more than is the sufferer from a malarial fever. It is only by yielding the parasite to the mosquito that the actual sufferer assists in carrying on the succession of cases, and while he retains the power of infecting the Stegomyia for little more than a week, the latter is capable of inoculating men by its bite for a couple of months, or longer. The patient may, therefore, be ignored and quarantine need not be entertained, the attention of the sanitary authorities of the port being concentrated on the exclusion of the Stegomyiæ from all vessels outward bound from ports within the endemic zone, whether the disease be actually present or not. To secure this Dr. Manson suggests that the sanitary control of the canal should be in the hands of the Government of the United States as a branch of the Marine Service, and wholly independent of the administration and local functionaries of the canal itself, with an official chief at Washington, and a resident superintendent of the stamp of Major Gorgas, who so ably carried out the work at Havana, assisted by inspectors and their subordinates. Every vessel on entering the canal from any port within the fever zone should be boarded by an inspector, with a couple of assistants, who would immediately apply themselves to the work of searching for and destroying the Stegomyiæ and their larvæ, while at the Pacific end of the canal the vessel would be boarded by another inspector, whose duty it would be to certify to the completeness of the process before she would be allowed to put out to sea. To avert the danger of Stegomyiæ getting on board a ship while passing through the canal, as they might easily do after she had been certified as free, Dr. Manson suggests the clearing of all underwood from a belt half a mile in width on either side, and the draining and filling up of ponds and depressions that might afford shelter and breeding places for the mosquitoes. The actual administration would, of course, be in the hands of Americans, but there might well be an international board of supervision, composed of representatives of those States whose territories and commercial interests in Asia and the far East were concerned, as Great Britain, India and Australia, Japan, France, Holland, and perhaps others, while the expenses would be defrayed by tolls levied on all vessels passing eastward through the canal. In the discussion that followed the reading of Dr. Manson's paper at the Epidemiological Society, Dr. Sambon remarked that the danger was even more imminent than was represented by the lecturer, since the China Commercial Steamship Company was about to open from March 1st a direct fortnightly service of cargo and passenger boats between Mexico and Hong Kong; so that yellow fever might be introduced into China apart from and before the completion of the Panama Canal.

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